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Hospitalisation in short-stay units for adults with internal medicine diseases and conditions (Review)

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[Intervention Review]

Hospitalisation in short-stay units for adults with internal medicine diseases and conditions

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ABSTRACT

Background

Short-stay units are hospital units that provide short-term care for selected patients. Studies have indicated that short-stay units might reduce admission rates, time of hospital stays, hospital readmissions and expenditure without compromising the quality of care. Short-stay units are often defined by a target patient category, a target function, and a target time frame. Hypothetically, short-stay units could be established as part of any department, but this review focuses on short-stay units that provide care for participants with internal medicine diseases and conditions.

Objectives

To assess beneficial and harmful effects of short-stay unit hospitalisation compared with usual care in people with internal medicine diseases and conditions.

Search methods

We searched CENTRAL, MEDLINE, Embase, three other databases and two trials registers up to 13 December 2017 together with reference checking, citation searching and contact with study authors to identify additional studies. We also searched several grey literature sources and performed a forward citation search for included studies.

Selection criteria

We included randomised trials and cluster-randomised trials, comparing hospitalisation in a short-stay unit with usual care (hospitalisation in a traditional hospital ward or other services). We defined a short-stay unit to be a hospital ward where the targeted length of stay in hospital for patients was five days or less. We included both multipurpose and specialised short-stay units. Participants were adults admitted to hospital with an internal medicine disease or condition. We excluded surgical, obstetric, psychiatric, gynaecological, and ambulatory participants. Trials were included irrespective of publication status, date, and language.

Data collection and analysis

We used standard methodological procedures expected by Cochrane. Two review authors independently extracted data and assessed the risk of bias of each included trial. We measured intervention effect sizes by meta-analyses for two primary outcomes, mortality and serious adverse events, and one secondary outcome, hospital readmission. We narratively reported the following important outcomes: quality of

life, activities of daily living, non-serious adverse events, and costs. We used risk ratio differences of 15% for mortality and of 20% for serious adverse events for minimal relevant clinical consideration. We rated the certainty of the evidence and the strength of recommendations of the outcomes using the GRADE approach.

Main results

We included 19 records reporting on 14 randomised trials with a total of 2872 participants. One trial was ongoing. Thirteen trials evaluated short-stay unit hospitalisation for six specific conditions (acute decompensated heart failure (one trial), asthma (one trial), atrial fibrillation (one trial), chest pain (seven trials), syncope (two trials), and transient ischaemic attack (one trial)) and one trial investigated participants presenting with miscellaneous internal medicine disease and conditions. The components of the intervention differed among the trials as dictated by the trial participants' condition. All included trials were at high risk of bias.

The certainty of the evidence for all outcomes was very low. Consequently, it is uncertain whether hospitalisation in short-stay units compared with usual care reduces mortality (risk ratio (RR) 0.73, 95% confidence interval (CI) 0.47 to 1.15) 5 trials (seven additional trials reporting on 1299 participants reported no deaths in either group)); serious adverse events (RR 0.95, 95% CI 0.59 to 1.54; 7 trials (one additional trial with 108 participants reported no serious adverse events in either group)), and hospital readmission (RR 0.80, 95% CI 0.54 to 1.19, 8 trials (one additional trial with 424 participants did not report results for participants)). There was not enough information to confirm or refute that short-stay unit hospitalisation had relevant effects on quality of life, activities of daily living, non-serious adverse events, and costs.

Authors' conclusions

Overall, the quantity and the certainty of the evidence was very low. Consequently, it is uncertain whether there are any beneficial or harmful effects of short-stay unit hospitalisation for adults with internal medicine diseases and conditions - more trials comparing the effects of short-stay units with usual care are needed. Such trials ought to be conducted with low risk of bias and low risks of random errors to improve the overall confidence in the evidence.

PLAIN LANGUAGE SUMMARY

Hospitalisation in short-stay units for adults with internal medicine diseases and conditions

What is the aim of this review?

To find out whether short stays in hospital in short-stay units improve outcomes in adults with internal medicine diseases and conditions compared to usual care.

Key messages

We are unsure about the effect of short-stay unit hospitalisation for adults with internal medicine diseases and conditions compared to usual care. The evidence was uncertain for several important reasons; including not having enough data, differences among participants and co-interventions, and problems with the methods that the trials used that could have led to false results. We need more high-quality trials to test the impact of short-stay unit hospitalisation on individual patients and costs.

What was studied in the review?

Short-stay units are hospital units that provide short-term care in selected patients. Their services are often defined by the type of patient, the unit's function, and a time frame. Studies have indicated that short-stay units may reduce the number of people admitted to hospital, the length of time they spend in hospital, the number of people who have to go back into hospital (readmission), and costs, without losing any quality of care, but a thorough evaluation of effects of short-stay unit hospitalisation compared with usual care (mainly hospitalisation in a traditional hospital ward) was lacking before we conducted the present review. The review focused on short-stay unit hospitalisation for internal medicine diseases and conditions, such as pneumonia or chest pain. We compared the effect of short-stay unit hospitalisation with usual care by looking at deaths (mortality), serious problems (serious adverse events), quality of life, activities of daily living (such as managing housework or medications), hospital readmission, non-serious adverse events, and costs.

What are the main results of the review?

The review authors found 14 relevant trials with a total of 2872 participants. All trials were randomised trials, i.e. people participating in the trials had been assigned by chance alone to either hospitalisation in a short-stay unit or a control group that received usual care. Randomised trials are considered to be the most reliable trial design to test effects of an intervention.

Thirteen trials evaluated short-stay unit hospitalisation for six specific conditions (asthma, atrial fibrillation (irregular heartbeat), chest pain, decompensated (worsening of the signs of) heart failure, syncope (losing consciousness due to a fall in blood pressure), and transient ischaemic attack (mini stroke)) and one trial did not specify which condition its participants had. We identified one ongoing trial. The components of short-stay unit hospitalisation differed among the trials depending on the trial participants' conditions. All of the included trials had problems with their methods that potentially could have led to false results. We were uncertain whether there was any difference

between short-stay unit hospitalisation and usual care for reducing mortality, serious adverse events, and hospital readmissions. We were not able to combine and examine results for any other outcomes, because the trials used different ways of measuring (e.g. using different scales), or did not give enough data, or reported their results in a way that meant we could not use them. Individual trials said that short-stay unit hospitalisation led to higher quality of life, fewer non-serious adverse events, and lower costs. However, we cannot be certain about this evidence and need to be careful about interpreting the trials' results; all included trials were at high risk of errors, which questions the validity of these results and we cannot exclude that the findings were merely due to the play of chance. It is crucial to validate the findings in larger, well-conducted trials.

How up-to-date is this review?

The review authors searched for trials that had been published before 13 December 2017.

Summary of findings for the main comparison. Short-stay unit hospitalisation compared with usual care for internal medicine diseases and conditions

Short-stay unit hospitalisation compared with usual care for internal medicine diseases and conditions

Patient or population: participants with internal medicine diseases and conditions
Setting: hospitals (emergency department-based short-stay units in Denmark, New Zealand, Spain, UK, and US
Intervention: short-stay unit hospitalisation
Control: usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care	Risk with short-stay unit hospitalisation				
Mortality at time point closest to 90 days	Study population 62 per 1000	45 per 1000 (29 to 71)	RR 0.73 (0.47 to 1.15)	1294 (5 RTs)	⊕⊖⊖⊖ Very low[a,b,c,d]	We were able to pool 5 trials in the meta-analysis. 7 additional trials reporting on 1299 participants reported no deaths in either group. Data were missing in 1% of participants.
Serious adverse events at time point closest to 90 days	Study population 77 per 1000	74 per 1000 (46 to 119)	RR 0.95 (0.59 to 1.54)	1907 (7 RTs)	⊕⊖⊖⊖ Very low[a,b,d,e]	We were able to pool 7 trials in the meta-analysis. 1 additional trial with 108 participants reported no serious adverse events in either group. Data were missing in 1% of participants.
Quality of life at time point closest to 90 days	1 trial demonstrated higher quality-of-life scores measured by SF-36 among participants hospitalised in short-stay units. 3 trials reported little or no difference in quality-of-life scores, using either EuroQol-5 Domain, Quality of Well Being Scale, the Syncope Functional Status Questionnaire, or Minnesota Living With Heart Failure Scale.		-	1029 (4 RTs)	⊕⊖⊖⊖ Very low[b,c,f,g]	We did not pool data because none of the trials reported quality of life using the same measurement tool. Data were missing in 20% of participants.
Activities of daily living at time point closest to 90 days	1 trial demonstrated a small improvement or no difference in Lawton's Instrumental Activities of Daily Living scores among participants hospitalised in short-stay units.		-	569 (2 RTs)	⊕⊖⊖⊖ Very low[b,c,f,g]	We were unable to pool data, because none of the trials reported activities of daily living using the same measurement tool. Data were missing in 19% of participants.

	1 trial demonstrated a small decrease or no difference in Older Americans Resources and Services instrumental Activities of Daily Living-score among participants hospitalised in short-stay units.				
Hospital readmission at time point closest to 90 days	Study population 167 per 1000	134 per 1000 (90 to 199)	RR 0.80 (0.54 to 1.19)	1753 (8 RTs)	⊕⊖⊖⊖ Very low[a,c,d,h]	We were able to pool 8 trials in the meta-analysis. Data were missing in 2% of participants. 1 additional trial with 424 participants did not report results.
Non-serious adverse events at time point closest to 90 days	1 trial demonstrated lower prevalence of adverse events among participants hospitalised in short-stay units, but there was no distinction between serious or non-serious adverse events. 1 trial demonstrated no difference between short-stay unit hospitalisation and usual care.		-	533 (2 RTs)	⊕⊖⊖⊖ Very low[b,c,f,g]	We did not pool data because 1 trial with 103 participants reported no adverse events in either group. Data were missing in 2% of participants.
Costs at time point closest to 90 days	8 trials reported reduction in costs among participants hospitalised in short-stay units.		-	1433 (8 RTs)	⊕⊖⊖⊖ Very low[b,c,f,g]	We did not pool data because we found substantial heterogeneity between the assessment of costs in the trials. Data were missing in 1% of participants, but the number might be higher because 2 trials did not clearly define the number of included participants in the cost analyses.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the control group and the __relative effect__ of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **RT**: Randomised trial; **SF-36**: Short Form-36 Health Survey

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

[a]Downgraded one level for serious risk of bias due to all trials being at high risk of bias, but because the outcome is a more objective outcome, lack of blinding of participants, personnel and outcome assessors may not bias the outcome as much.
[b]Downgraded one level for clinical heterogeneity among the included trials.
[c]Not downgraded for indirectness.

[d]Downgraded two levels due to low number of events and the 95% confidence interval around the pooled estimate of effect included both appreciable benefit or appreciable harm.
[e]Downgraded one level due to indirect evidence (surrogate outcome measures for adverse events).
[f]Downgraded two levels due to all trials being at high risk of bias.
[g]Not downgraded for imprecision. We were not able to evaluate estimate of effect in meaningful meta-analysis.
[h]Downgraded two levels for clinical and statistical heterogeneity among the included trials.

BACKGROUND

Acute healthcare systems are under pressure. A steadily increasing demand for acute care delivery, decreasing number of acute care beds, and escalating healthcare costs have been observed worldwide (Lowthian 2011; WHO 2011). On a daily basis, both emergency departments and in-hospital services have to deal with hazardous patient overflow (Sprivulis 2006). One proposed solution to these challenges is to establish short-stay units (Salazar 2007). A short-stay unit is a hybrid ward that on one hand can offload stable patients from the emergency department or traditional wards for further investigations and risk stratification, and on the other hand can accommodate lower acuity patients, who need short-term monitoring, observation, focused diagnostics, or therapeutic interventions (Galipeau 2015).

Short-stay units are believed to play a pivotal role in optimising the effectiveness of hospitals by streaming selected patients away from the traditional hospital ward services and expediting care for uncomplicated patients. Academic societies, such as The American College of Emergency Physicians specifically recommend implementation of short-stay units in emergency departments (ACEP 2008), and The European Society of Cardiology has recommended implementation of syncope short-stay units (Kenny 2015).

Several studies have indicated that short-stay units are capable of providing shorter hospital stays, reducing hospital readmission rates, lowering costs, and improving patient satisfaction (Arendts 2006; Farkouh 1997; Goodacre 2007; Roberts 1997; Ross 2013; Rydman 1997). However, other studies have questioned the positive findings by demonstrating inadequate efficiency (Russell 2014). This review set out to investigate whether short-stay unit hospitalisation is a viable alternative to usual care for patients with internal medicine diseases and conditions.

Description of the condition

This review focuses on adults with diseases or conditions within the spectrum of internal medicine, including conditions that are usually treated in internal medicine departments, for example, anaemia, asthma, cellulitis, chest pain, deep venous thrombosis, or urinary infections. Management of these patients can be challenging; patients can present with several non-specific symptoms from various organ systems and different diseases, both acute and chronic, and require complex investigations and multifaceted care, such as the involvement of different specialists, special nursing expertise, respiratory therapy, or physiotherapy. Accordingly, people with internal medicine diseases account for the majority of health care provided in hospitals. Worldwide, internal medicine diseases such as diabetes and cardiovascular disease are the leading cause of disability and death (CDC 2013; EFIM 2007; WHO 2011). Prevalences of chronic internal medicine diseases are rapidly rising; currently, one in two adults is affected by at least one chronic disease (Gerteis 2014; Pfuntner 2013; WHO 2011; Wolff 2002). This spreads into the acute care system because an increasing number of people need acute hospitalisation due to worsening of symptoms of a chronic disease (Dang-Tan 2015; WHO 2011). Additionally, infectious diseases such as pneumonia or urinary tract infections are still common reasons for acute hospitalisation (Christensen 2009, Pfuntner 2013; Weiss 2014). Infectious diseases continue to be associated with substantial morbidity and mortality (Christensen 2009; Lowthian 2011). Despite theoretical advances in sanitation and health care, the annual hospitalisation rate for infectious diseases has increased over recent decades. For example, the incidence has been estimated at 15 hospitalisations per 1000 people per year in the USA (Christensen 2009).

Description of the intervention

The intervention of interest is short-stay unit hospitalisation for internal medicine diseases and conditions. Since the 1960s, short-stay units have been introduced increasingly in Western countries (Cerce 1981; Galipeau 2015). The earliest models targeted paediatric and surgical patients (Laskin 1972). Subsequent models have targeted internal medicine patients (Daly 2003).

Numerous names for short-stay units can be found in the literature, such as observation unit, acute medical unit, medical assessment and planning unit, or quick diagnostic unit. There is no widely-accepted definition of short-stay units, but their services are often defined by:

- a target patient category, for example, paediatric patients, adult patients with acute asthma, or surgical patients;
- a target function, for example, observation care, or interventions driven by protocols; and
- a target time frame of maximum stay in the unit, often set between 6 to 72 hours (Daly 2003; Damiani 2011; Galipeau 2015).

Target patient category

To ensure an optimal flow of patients, many short-stay units use strict admission and discharge criteria (Galipeau 2015; Gaspoz 1991). Specialised short-stay units accommodate a narrow and well-defined group of patients such as adult patients with chest pain or patients with acute exacerbation of asthma (Broquetas 2008; Jibrin 2008), while multipurpose short-stay units accommodate patients with a wide range of clinical symptoms and conditions (Arendts 2006; Strøm 2017a). Many short-stay units exclusively admit patients with minor medical ailments, for example, chronically ill patients needing blood transfusions, or acutely admitted patients with concussions in need of observation.

Target function

Many short-stay units are utilised to provide brief observation or diagnostic investigations for acute patients in order to make more appropriate disposition and management decisions (Mosely 2013). To alleviate emergency department crowding, many short-stay units serve as a buffer for the emergency departments by accommodating patients for initial triage and assessments (Galipeau 2015). Some also provide brief therapeutic interventions. Compared with usual care in an ordinary internal medicine ward, many short-stay units apply components that potentially streamline patient care, and accelerate the diagnostic process or rehabilitation time. Examples of elements of such fast-track care include early discharge planning; immediate access to laboratory tests, investigations, imaging, or standardised observation; and diagnostic or intervention protocols (Daly 2003; Galipeau 2015; Gaspoz 1991).

Often, patients admitted to a short-stay unit have received an evaluation upon arrival in an emergency department (physical exam, medical history, medications review) and an initial plan for salvage of acute symptoms (Juan 2006). In the short-stay

unit, further observation, diagnostics and treatments are carried out (Downing 2008). To optimise treatment and early discharge, evaluation upon arrival in a short-stay unit often includes assessments of functional capacity and the need for support after discharge, and planning of out-of-hospital care for non-acute medical problems (Daly 2003; Galipeau 2015).

The units are a ward, bay, or a defined area located adjacent to or within a department. Some short-stay units function as separate entities, while others function as part of a larger department, often as a part of an emergency department (Daly 2003; Damiani 2011; Galipeau 2015). A short-stay unit can therefore be run either by dedicated house staff, hospitalists, or under the clinical governance of the emergency department staff. Short-stay units are usually equipped with emergency medical treatment facilities, and sometimes advanced diagnostic equipment, such as radiologic or laboratory facilities (Daly 2003; Miller 2010; Miller 2013).

Target time frame

To facilitate a high turnover of patients in short-stay units, many institutions use a target time frame of maximum stay in units. The limit is often set between 6 to 72 hours for emergency department-based units (Galipeau 2015).

How the intervention might work

Short-stay units are likely to work as an intervention because they may reflect a more efficient service design, result in less exposure to adverse events during hospitalisation and provide tailored care for selected patients.

Short-stay units may represent a more efficient service design by reducing the time spent in hospital for patients. This may lead to less exposure to treatment errors and hospital-acquired conditions, such as adverse events, or loss of functional capacity due to immobilisation. Adverse events during hospitalisation occur frequently (Brennan 1991). For example, medication errors, falls, delirium (Inouye 1990), or nosocomial infections (Baker 2004; Brennan 1991; Thomas 2000). Despite high hospital sanitation standards, hospitalised patients cannot be entirely isolated from harmful microbes; infections may spread to susceptible patients from other patients, healthcare staff, or contaminated equipment. Large population studies have estimated that 3% to 17% of all hospitalised patients experience an adverse event during an episode of hospitalisation, and adverse events are associated with substantial physical impairment and mortality (Baker 2004; Brennan 1991; Thomas 2000; Vries 2008). Moreover, adverse events are associated with prolonged length of stay in hospital (Classen 1997), but it is unclear to what extent adverse events lead to prolonged length of stay in hospital, or whether prolonged hospital stay increases the risk of an adverse event (Strøm 2017b). We hypothesise that minimising length of stay in hospital by short-stay unit hospitalisation results in less exposure to adverse events during hospitalisation.

Short-stay units are expected to possess cost-sparing properties due to the nature of the focused care model. Studies have indicated that short-stay units are able to reduce traditional hospital ward admission rates and lower expenditures without compromising the quality of care (Roberts 1997; Sun 2014). The number of hospital readmissions is often used as a quality indicator of hospital care. Studies have indicated that short-stay units can reduce hospital readmission rates (Damiani 2011; Decker 2008; Miller 2010; Miller 2013). Furthermore, short-stay unit hospitalisation has been associated with higher patient satisfaction scores (Rydman 1997).

Optimising the diagnostic, treatment and rehabilitation processes in a short-stay unit may also improve patient outcomes. Tailored care with focused assessments or specific treatment protocols may enhance recovery for some patients. Many short-stay units incorporate components of accelerated care into patient care, in a manner similar to those studied in surgical populations, sometimes referred to as the 'enhanced recovery after surgery' programme (ERAS). ERAS is based on the application of standardised treatment protocols and certain fast-track elements, such as accelerated mobilisation, early removal of drains or tubes, and early discharge planning. Systematic reviews have found that ERAS seems to reduce morbidity rates, speed up recovery, and shorten the duration of hospital stay (Spanjersberg 2011; Wind 2006). However, the contribution of each of the ERAS programme components remains uncertain. We find it possible that patients with internal medicine diseases and conditions may benefit in a similar way from streamlined care in short-stay units. Prevention of prolonged bed rest may improve rehabilitation and prevent functional decline related to hospitalisation. Early discharge planning may facilitate faster and appropriate discharge processes (Daly 2003; Galipeau 2015).

Why it is important to do this review

Treatment of patients with internal medicine diseases and conditions accounts for the vast majority of healthcare expenditures (WHO 2011) and costs are expected to rise significantly (Cowling 2014), especially because the global population is dramatically ageing (UN 2013). There is an urgent need to explore how healthcare systems can successfully adapt to this challenge, while providing the best possible care for patients. Implementation of short-stay units may be one useful strategy to cope with the increasing demand for hospital care. Already, there has been a substantial growth in short-stay units (Salazar 2007). Patients, payers, and healthcare systems have great interest in knowing the benefits and harms of this model of care, but the evidence has been sparse. In a review more than a decade old, Daly and colleagues concluded that short-stay units had the potential to reduce patients' length of stay in hospital, improve the efficiency of emergency departments, and improve cost effectiveness (Daly 2003). Since then, two systematic reviews have proposed that treatment of internal medicine diseases and conditions in short-stay units may reduce inpatient mortality and length of stay in hospital without increasing hospital readmission rates (Damiani 2011; Scott 2009). Another systematic review described the effect of multipurpose short-stay units on emergency department overcrowding, and assessing the units' effectiveness and safety, as reported in trials conducted in countries with healthcare systems similar to Canada (Galipeau 2015). They found the evidence to be insufficient (Galipeau 2015). This review is necessary to assess the effectiveness of both specialised and multipurpose short-stay units across a number of patient-centred and resource outcomes.

OBJECTIVES

To assess beneficial and harmful effects of short-stay unit hospitalisation compared with usual care in people with internal medicine diseases and conditions.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised trials assessing the effect of short-stay unit hospitalisation compared with usual care for internal medicine diseases and conditions irrespective of publication date, publication type and status, reported outcomes, and language. We excluded quasi-randomised trials.

Types of participants

Eligible participants were hospitalised adults (aged 18 years or above) receiving care for any internal medicine disease or condition, including conditions that are usually treated at internal medicine departments (such as cellulitis, chest pain, chronic obstructive pulmonary disease, dyspnoea, or pneumonia). Surgical, obstetric or gynaecological participants, participants with mental illnesses, and ambulatory participants were not included.

Types of interventions

Experimental group

The intervention was hospitalised treatment in a short-stay unit. As indicated in the 'Description of the intervention' section, there is no widely accepted definition of short-stay units. We defined a short-stay unit to be a hospital ward where the targeted length of stay in hospital for patients was five days or less. Prior to the review, we identified a list of different names of short-stay units by handsearching the literature (Appendix 1). We accepted all of these terms, but the list was not comprehensive and we accepted other relevant terms if the time limit of length of stay in the unit was described and fulfilled our definition. We included both multipurpose and specialised short-stay units and reported the details of each unit.

Control group

Usual care/hospitalisation as defined by trial authors (mainly hospitalisation in a non-short-stay unit, but other services could be included such as hospital-at-home).

Types of outcome measures

We assessed the following outcomes (in accordance with their classification in EPOC 2013a):

- patient-centred outcomes: mortality, activities of daily living, quality of life;
- adverse events or harms: serious adverse events, non-serious adverse events; and
- utilisation, coverage, or access: hospital readmission, length of stay in hospital, transfer to another department, costs.

We assessed all outcomes at two time points:

- the time point closest to 90 days after randomisation (this was the outcome of primary interest); and
- at maximum follow-up.

Primary outcomes

- Mortality; proportion of participants that died at any time and of any cause
- Serious adverse events; proportion of participants with one or more serious adverse events as defined by the International Committee of Harmonisation-Good Clinical Practice (ICH-GCP): "any untoward medical occurrence that resulted in death, was life threatening, required inpatient hospitalisation or prolongation of existing hospitalisation, resulted in persistent or significant disability/incapacity" (ICH-GCP 1997).

Secondary outcomes

- Quality of life; measured on any valid scale, such as the 36-item Short Form Health Survey (SF-36) (Ware 1992)
- Activities of daily living; measured on any valid scale, such as Lawton's Instrumental Activities of Daily Living score (iADL) (Lawton 1969)
- Hospital readmissions; proportion of participants who were readmitted to hospital after index hospitalisation
- Non-serious adverse events; proportion of participants with a registration of any untoward medical occurrence
- Transfer to another department; proportion of participants who were transferred to hospitalisation in another department after initial admission to either the short-stay unit or usual-care group unit/ward
- Total length of stay in hospital; time from admission to discharge of index hospital stay. We evaluated this outcome with caution, because short hospitalisation was an implicit aim of the intervention.
- Comparable costs; we compared costs in a narrative way.

Reporting of the outcomes listed above were not an inclusion criterion for the review. We included all outcomes at the time point closest to 90 days after randomisation in Summary of findings for the main comparison.

Search methods for identification of studies

The EPOC Information Specialist developed the search strategies in consultation with the review authors.

Electronic searches

We searched the following databases on 13 December 2017:

- Cochrane Central Register of Controlled Trials (CENTRAL; 2017 Issue 11) in the Cochrane Library;
- MEDLINE Ovid (including Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Versions) (1946 onwards)
- EmbaseOvid (1974 onwards)
- Health Technology Assessment Database (HTA; 2016, Issue 4) in the Cochrane Library

The Medline search was peer reviewed according to the PRESS checklist (Peer Review of Electronic Search Strategies) (McGowan 2016) by a second Cochrane Information Specialist prior to translating it for running on other databases. Search strategies are comprised of keywords and controlled vocabulary terms. We applied no language or time limits. We searched all databases from database start date to date of search.

We searched the Cochrane Database of Systematic Reviews (CDSR) and the Database of Abstracts of Reviews of Effects (DARE) for primary trials included in related systematic reviews.

Searching other resources

We conducted grey literature searches to identify studies not indexed in the databases listed above.

We searched:

- International Clinical Trials Registry Platform (ICTRP), World Health Organization (WHO), (searched 17 December 2017);
- ClinicalTrials.gov, US National Institutes of Health (NIH) (ClinicalTrials.gov), (searched 17 December 2017);
- OpenGrey, (searched 17 December 2017);
- Grey Literature Report (New York Academy of Medicine) (www.greylit.org), (searched 17 December 2017);
- Health Services Research Projects in Progress (HSRProj) (NICHSR), (searched 17 December 2017).

We also:

- searched other web sources, such as the King's Fund library database (www.kingsfund.org.uk/library) and Google Scholar (scholar.google.com) (searched 17 December 2017);
- contacted authors of relevant trials and reviews to clarify reported information or seek unpublished results/data, (from 28 February 2017 to 17 December 2017);
- searched individual journals and conference proceedings (to 17 December 2017);
- conducted a forward citation search of the included trials using Science Citation Index via ISI Web of Science (pcs.webofknowledge.com), (to 17 December 2017);
- searched the reference lists of all included studies (to 17 December 2017);
- searched the reference lists of systematic reviews on short-stay unit hospitalisation found in the search (to 17 December 2017).

All search strategies used are provided in Appendix 2.

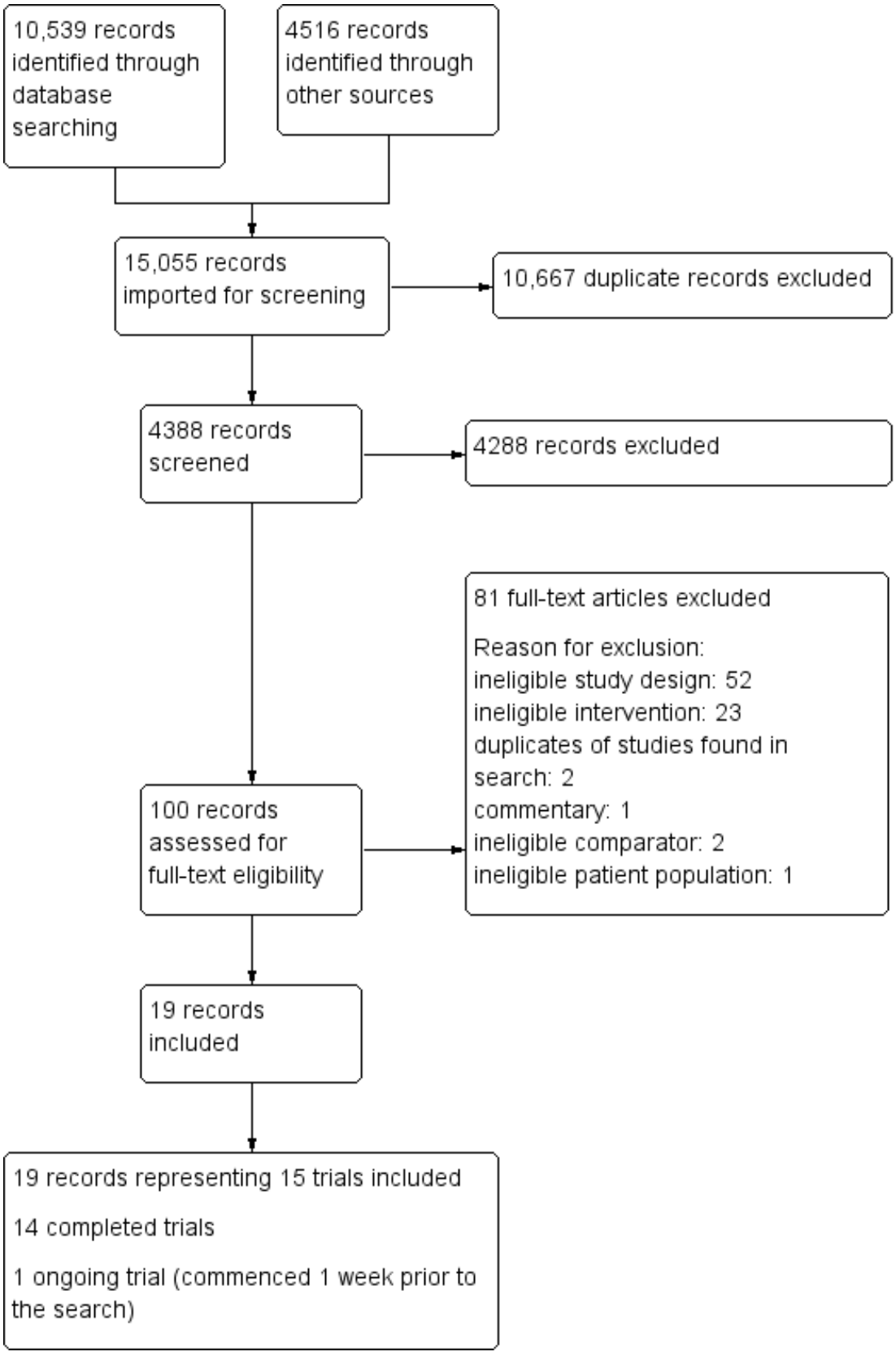
Data collection and analysis

We performed the review according to the review protocol (Strøm 2016), Cochrane's recommendations (Higgins 2011a), and the recommendations of Cochrane Effective Practice and Organisation of Care (EPOC 2013b). We used Review Manager 5 (RevMan 5) to perform the analyses (RevMan 2014).

Selection of studies

We downloaded all titles and abstracts retrieved by the electronic search to endnote (Endnote X7) and removed duplicates. We imported titles and abstracts to the web-based software platform, Covidence (Covidence 2015). Two review authors (CS, JS, or MF) independently assessed all titles and abstracts for eligibility. We excluded trials that did not obviously match the inclusion criteria (see trial screening template; Appendix 3). Two review authors (CS, JS, or MF) independently assessed full-text reports of the remaining trials and excluded any that clearly did not meet the eligibility criteria. If there were any disagreements, a third review author (JCJ) was asked to arbitrate. We collated multiple reports of the same trial so that each trial rather than each report was the unit of interest in the review. Trials that were thought likely to be relevant, but that were subsequently excluded, we listed in the 'Characteristics of excluded studies' table including the reason for their exclusion (EPOC 2013c). The selection process is demonstrated in a PRISMA flow diagram (Liberati 2009; Figure 1).

Figure 1. PRISMA study flow diagram



Data extraction and management

We used a modified EPOC data collection form (EPOC Supplementary materials) to capture trial characteristics and outcome data. Two review authors (CS, JS, or MF) extracted data independently, and validated data in pairs. Disagreements were resolved through involvement of a third review author (JCJ). We contacted trial authors for additional information and data as required. We noted in the 'Characteristics of included studies' tables if outcome data were reported in an unusable way.

Assessment of risk of bias in included studies

We assessed the risk of bias for all included trials in pairs (CS, JS, or MF) using the criteria outlined in chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011b), and the guidance from the EPOC Group (EPOC 2015a). We assessed all trials for allocation sequence generation, allocation concealment, baseline outcome measurement, baseline characteristics, blinding of outcome assessment, incomplete outcome data, contamination, selective outcome reporting, and other risk of bias. We considered it impossible for any trial to have blinded participants or treatment providers, and we chose not to include blinding of participants or treatment providers as bias domains.

We assessed each potential source of bias as high, low or unclear, and provided a justification for our judgment in a 'Risk of bias' table for each trial (see 'Characteristics of included studies'). Where information on the risk of bias related to unpublished data or correspondence with a trial author, we noted this in the 'Risk of bias' table.

We summarised our judgments in the 'Risk of bias' graph (Figure 2) and the 'Risk of bias' summary (Figure 3).

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included trials.

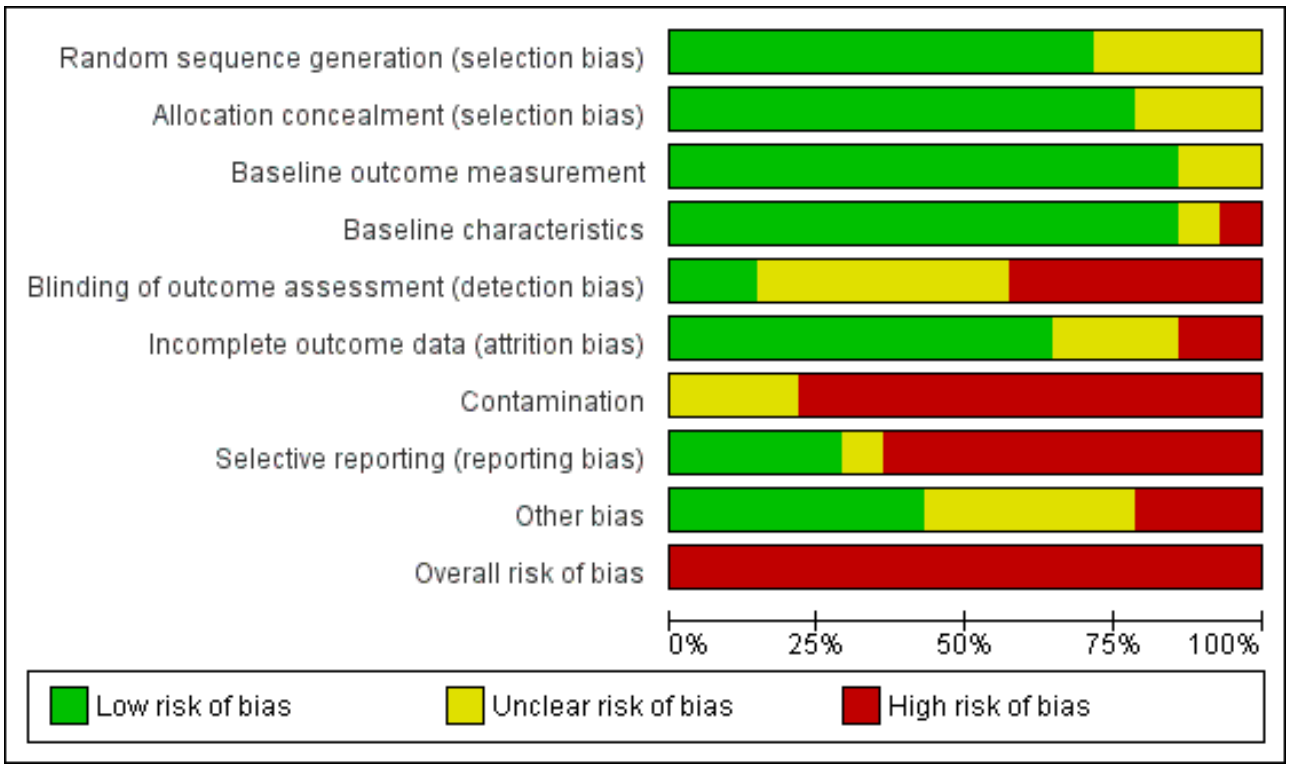
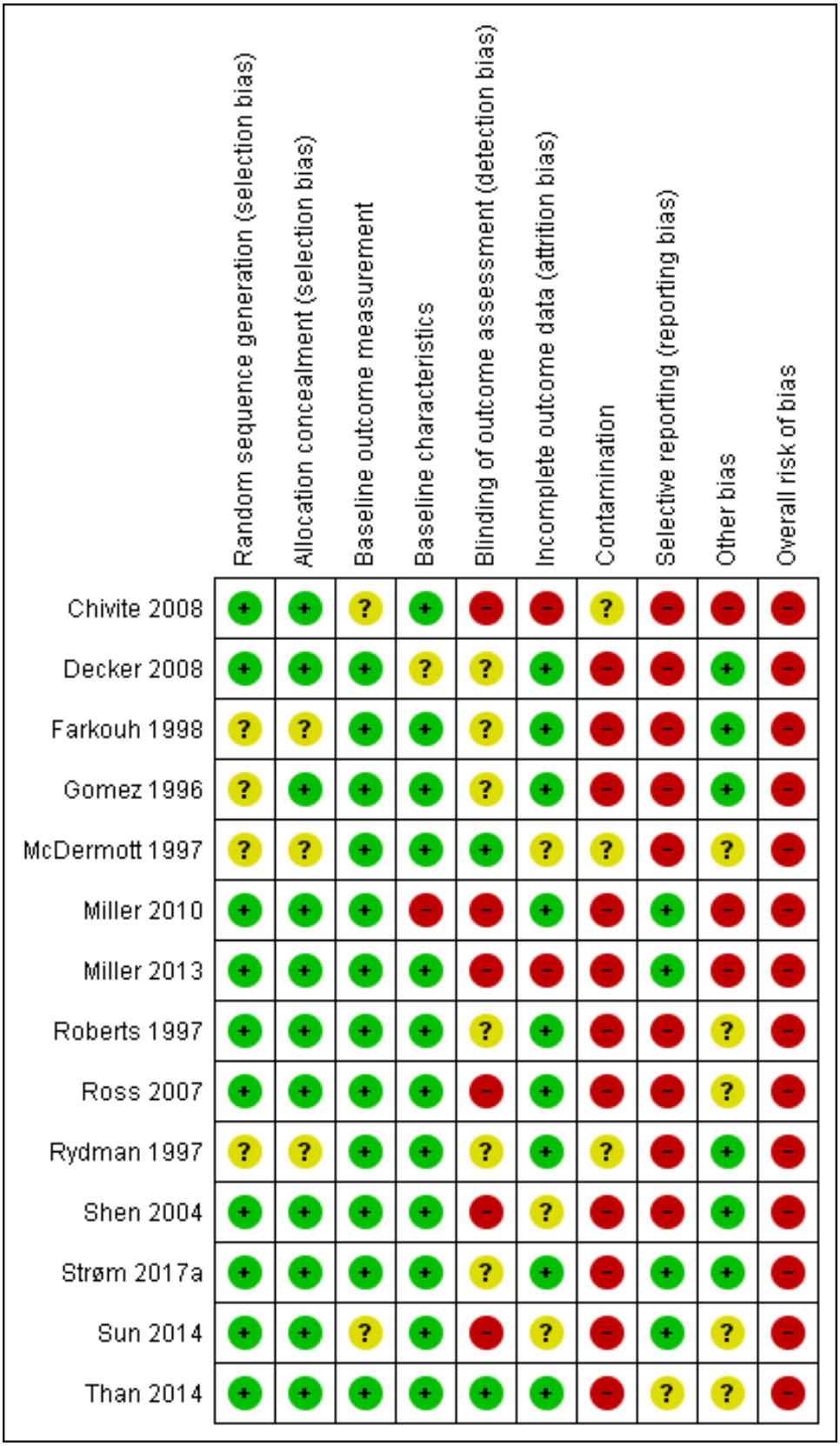


Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included trial.



Measures of treatment effect

Dichotomous outcomes

We calculated risk ratios (RR) and risk ratio differences together with 95% confidence intervals (95% CIs).

Continuous outcomes

We planned to include both end scores and change scores and report the mean difference (MD) with 95% CIs if all the trials used the same outcome scale, and standardised mean difference (SMD) with 95% CIs when the trials measured the same continuous outcome, but used different scales.

Minimal relevant clinical difference

For each outcome, we predefined a minimal relevant clinical difference between the intervention and control group.

- Mortality: reduction or increase in risk ratio of 15%
- Serious adverse event: reduction or increase in risk ratio of 20% (Baker 2004; Brennan 1991)
- Quality of life: a clinically relevant mean difference was equal to the observed standard deviation/2 (Jakobsen 2014)
- Activities of daily living: a clinically relevant mean difference was equal to the observed standard deviation/2 (Jakobsen 2014)
- Hospital readmission: reduction or increase in risk ratio of 20% (Miller 2013; Roberts 1997)
- Non-serious adverse events: reduction or increase of 20% in risk ratio.
- Transfer to other department: reduction or increase of 30% in risk ratio.
- Total length of stay in hospital: reduction or increase of 20% in risk ratio (Miller 2010; Miller 2013; Roberts 1997)

We did not report results as being statistically significant or non-significant (EPOC 2013f). Instead, we discussed the precision of the outcome estimates and considered whether the size of the effect was important, less important or not important according to the EPOC guidance (EPOC 2013b).

Unit of analysis issues

We planned to assess the effects of randomised trials and cluster-randomised trials separately using the generic inverse variance method according to chapter 9 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2011) to meta-analyse both types of trials in one analysis if possible. If the trial authors had not used appropriate methods to account for clustered data, we planned to follow the instructions in chapter 16 of the *Cochrane Handbook for Systematic Reviews of Interventions* to estimate 'effective sample sizes' (Higgins 2011c).

Dealing with missing data

We contacted investigators in order to obtain missing outcome data where possible (e.g. when a trial was identified as an abstract or if data were reported in an unusable way). Where possible, we analysed trials on an intention-to-treat basis. We did not impute missing values for any outcomes in our primary analysis. To explore the potential impact of missing data, we imputed data in order to conduct evaluation of best-worst and worst-best case scenarios (see Sensitivity analysis).

Assessment of heterogeneity

We investigated forest plots to visually assess heterogeneity. We tested statistical heterogeneity using the Chi^2 test with a significance level set at $P \leq 0.10$ and measured the quantities of heterogeneity using the I^2 statistic (Deeks 2011; Higgins 2003).

Assessment of reporting biases

To reduce the risk of reporting bias, we undertook comprehensive searches of multiple databases and trials registries, and contacted trial authors to obtain missing information. We planned to create and examine funnel plots to explore possible publication biases if we were able to pool 10 trials or more in meta-analyses. If there were fewer than 10 trials available, we deemed publication bias to be non-assessable (Sterne 2011a).

Data synthesis

Meta-analysis

We performed both random-effects meta-analyses (DerSimonian 1986) and Mantel-Haenszel fixed-effect meta-analyses (Mantel 1959). We reported the more conservative point estimate of the two; that is, the estimate closest to zero effect (Jakobsen 2014), because the fixed-effect meta-analysis may show erroneous results if there is substantial statistical heterogeneity and the random-effects meta-analysis may show erroneous results if one or two trials account for approximately 80% or more of the total weight in the meta-analysis (Jakobsen 2014). When estimates were equal, we used the estimate with the widest confidence interval (CI).

For the outcomes mortality, serious adverse events, and hospital readmission, we undertook meta-analyses at the time point closest to 90 days and at end of follow-up. For the outcomes: quality of life, activities of daily living, non-serious adverse events, transfer to another department, total length of stay in hospital, and costs, we were not able to conduct meaningful meta-analyses. Instead, we compiled narrative summaries.

'Summary of findings' table and GRADE

For the main intervention comparison (the outcomes as assessed at the time point closest to 90 days), three review authors in pairs (CS, JS, or MF) used the GRADE tool independently to assess the certainty of the evidence for each outcome (high, moderate, low, and very low) with respect to five criteria (inconsistency, indirectness, imprecision, publication bias, and risk of bias) (Guyatt 2008). We resolved disagreements through discussion. We used the GRADEpro GDT software and the recommendations from the *Cochrane Handbook for Systematic Reviews of interventions* (GRADEpro GDT 2015; Schünemann 2011). We prepared a 'Summary of findings' table (Summary of findings for the main comparison) of the most important outcomes including the justification for our decisions to downgrade the certainty of the evidence for an outcome, along with comments to help the reader understand the process (EPOC 2013d, EPOC 2013e).

Subgroup analysis and investigation of heterogeneity

We performed the following subgroup analysis on the outcomes mortality, serious adverse events, and hospital readmission for the comparison of the effect of short-stay unit hospitalisation compared with usual care, between trials investigating:

- multipurpose short-stay units compared with specialised short-stay units (e.g. multipurpose short-stay unit, or dedicated chest pain short-stay unit);
- younger compared with older participants (participants were defined as 'older' either by the trial authors or they were aged over 65 years).

We regarded these findings to be observational. We used the test of interaction to analyse the test for subgroup differences (Deeks 2011; RevMan 2014).

We had planned to perform additional subgroup analyses but we were unable to due to a lack of data. We will perform these analyses in future updates of this review if data are available. See Differences between protocol and review for more details.

Sensitivity analysis

We performed sensitivity analyses defined a priori to assess the robustness of our conclusions and explore the impact on effect sizes. This involved:

- restricting the analyses to published trials;
- imputing missing data.

We analysed the impact of missing data by best-worst and worst-best case scenario analyses for dichotomous outcomes.

- 'best-worst case' scenario: we assumed that all participants lost to follow-up in the intervention group survived, had no serious adverse event, or were not readmitted. We assumed that all participants lost to follow-up in the usual-care group did not survive, had a serious adverse event, or were readmitted;
- 'worst-best case' scenario: we assumed that all participants lost to follow-up in the intervention group did not survive, had a serious adverse event, or were readmitted. We assumed that all participants lost to follow-up in the usual-care group survived, had no serious adverse event, or were not readmitted.

We did not conduct sensitivity analyses for continuous outcomes as planned. We also did not conduct sensitivity analyses as outlined in Assessment of risk of bias in included studies for trials with a low risk of bias, or for trials that evaluated outcomes at least once within six months of inclusion (i.e. six months of the participant being included in the trial). See Differences between protocol and review.

RESULTS

Description of studies

We assessed all trials according to the *Cochrane Handbook of Systematic Reviews of Interventions* (Higgins 2011a), and the protocol for this review (Strøm 2016). Characteristics of each trial can be found in 'Characteristics of included studies' and 'Characteristics of excluded studies'.

Results of the search

We identified a total of 15,055 potentially relevant records from all sources searched. We removed 10,667 duplicates, and excluded 4288 records by the first screening process. We reviewed the full text of 100 records, of which one was a record found by forward citation. We obtained eight abstracts, 87 full reports, and 15 trial registrations, and a minimum of two review authors (CS, JS, or MF) independently reviewed them to assess eligibility. We identified one ongoing trial (NCT03302910). The reason for exclusion of trials and studies are described in Characteristics of excluded studies. The PRISMA flow diagram of the selection process is presented in Figure 1.

Included studies

We included 19 records reporting on 14 randomised trials in the review; one abstract, two trial registrations, and 16 full-text reports. One trial was ongoing. All but one trial were conducted between 1991 and 2016. We identified two unpublished trials. In one trial, the trial authors never sought to publish the results (Chivite 2008). The other trial was first accepted for publication after the search had been conducted; hence, we treated data as unpublished throughout the review (Strøm 2017a). The first author of this review was also the author of this trial, so all data extraction for this trial was performed by assessors not included in it (Strøm 2017a). Details on the included trials are listed in Characteristics of included studies; Table 1; and Table 2.

We contacted authors of all of the included trials to seek or clarify information. The authors of nine of the trials responded (Chivite 2008; Decker 2008; Gomez 1996; Miller 2010; Miller 2013; Shen 2004; Strøm 2017a; Sun 2014; Than 2014; Table 3).

Settings

Trials were undertaken in Denmark, New Zealand, Spain, UK, and USA. Eight were conducted at three institutions in the USA: three trials at The Mayo Clinic in Rochester, Minnesota (Decker 2008; Farkouh 1998; Shen 2004), three at Cook County Hospital in Chicago, Illinois (McDermott 1997; Roberts 1997; Rydman 1997), and two trials at Wake Forest Baptist Medical Centre in Winston-Salem, North Carolina (Miller 2010; Miller 2013). Trial paper publication dates ranged from 1996 to 2014.

Eight of the trial reports were co-authored by one or more trial authors involved in more than one trial of short-stay units (Decker 2008; Farkouh 1998; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Rydman 1997; Shen 2004).

Target function

All trials investigated emergency department-based short-stay units. Eight trials investigated multipurpose units (Chivite 2008; Decker 2008; Miller 2010; Miller 2013;Ross 2007; Strøm 2017a; Sun 2014; Than 2014), five trials investigated a specialised unit (Farkouh 1998; Gomez 1996; Roberts 1997; Rydman 1997; Shen 2004), and in one trial it was not clear whether the short-stay unit was specialised or not. The authors named the short-stay unit an "Emergency and Diagnostic Treatment Unit", and we assumed that this was a multipurpose unit (McDermott 1997).n 12 trials, the interventions were driven by treatment protocols (Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004; Sun 2014; Than 2014).

Participants, experimental interventions and control interventions

The 14 includedtrials randomised a total of 2872 participants (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Rydman

1997; Shen 2004; Strøm 2017a; Sun 2014; Than 2014). The number of participants in each trial ranged from 100 to 544 participants.

Target patient category

One trial included participants with acute asthma (McDermott 1997), one included participants with atrial fibrillation (Decker 2008), seven included participants with chest pain (Farkouh 1998; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Rydman 1997; Than 2014), one included participants with acute decompensated heart failure (Chivite 2008), two included participants with syncope (Shen 2004; Sun 2014), one included participants with transient ischaemic attack (Ross 2007), and one included participants with miscellaneous internal medicine disease and conditions (Strøm 2017a).

Target time frame

In total, seven trials used a maximum time frame as part of the intervention protocol (Decker 2008; McDermott 1997; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004; Sun 2014). The maximum stay in the unit was set to six hours in one trial (Shen 2004), eight hours in one trial (Decker 2008), 12 hours in three trials (McDermott 1997; Roberts 1997; Rydman 1997), and 24 hours in two trials (Ross 2007; Sun 2014).

Five trials described a target maximum time frame, but the participants could occasionally have longer stays in the short-stay unit. Thus, the time frame was set to 16 hours in one trial (Than 2014), 24 hours in two trials (Miller 2010; Miller 2013), 72 hours in one trial (Strøm 2017a), and 120 hours in one trial (Chivite 2008).

The time frame was unclear in two trials (Farkouh 1998; Gomez 1996), but it appeared to be nine hours in one trial (Gomez 1996), because this was the time point for the last test that either led to discharge or admission to another hospital ward. The other trial merely said that participants were observed for a minimum of six hours in the short-stay unit (Farkouh 1998).

Interventions

The majority of the trials used a specific disease or condition as inclusion criteria and the components of the short-stay unit intervention were dictated by these conditions. Hence, we present below the characteristics of the randomised participants and the interventions by condition.

Trials randomising participants with asthma

Participants: the mean age of participants in the single trial including people with asthma was 36 years in the intervention group compared with 35 years in the usual-care group, and more men were included (men in short-stay unit versus usual-care group: 58% versus 64%; McDermott 1997).

Interventions: one multicentre trial compared short-stay unit hospitalisation with inpatient care in participants with acute asthma (McDermott 1997). Participants randomised to short-stay unit hospitalisation received a standard-treatment protocol including scheduled therapy with inhaled bronchodilating agents and steroids, and repetitive clinical assessments. When participants met a set of predefined discharge criteria, they were discharged. The usual-care group received standard treatment according to national asthma guidelines in a hospital ward. Discharge criteria were identical to the intervention group, but participant assessments were only scheduled at time of arrival at the ward and on daily rounds (one round a day).

Trials randomising participants with atrial fibrillation

Participants: the mean age of participants in the single trial including people with atrial fibrillation was 58 years in the intervention group compared with 59 years in the usual-care group, and more men were included (men in short-stay unit versus usual-care group: 53% versus 69%; Decker 2008).

Interventions: one single-centre trial compared short-stay unit hospitalisation with inpatient care in participants with newly onset atrial fibrillation (Decker 2008). Participants randomised to short-stay unit hospitalisation received a standard care protocol including electrocardiogram recording, chest radiograph, routine laboratory investigations, pharmacologic pulse rate control, and continuous cardiac monitoring. If the condition had not resolved within six hours, participants underwent electrical cardioversion, and a further two hours of observation. Those remaining in atrial fibrillation after eight hours were admitted to the cardiology service. The usual-care group was treated conventionally at the cardiology service.

Trials randomising participants with chest pain

Participants: the mean age of participants in the seven trials that included people with chest pain ranged from 50 to 61 years in the intervention group compared with 50 to 64 years in the usual-care group. Slightly more men were included (range of proportion of men in short-stay unit versus usual-care group: 47% to 64% versus 52% to 69%; Farkouh 1998; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Rydman 1997; Than 2014). Three trials included participants who were stratified to have low probability of acute coronary syndrome (Gomez 1996; Roberts 1997; Rydman 1997), three trials included participants who were stratified to have intermediate or high probability of acute coronary syndrome (Farkouh 1998; Miller 2010; Miller 2013), and one trial did not use risk stratification as an inclusion criteria (Than 2014).

Interventions: in all seven trials, the intervention comprised 2 to 12 hours of observation in a short-stay unit, administration of aspirin, scheduled cardiac biomarker testing, and a cardiac stress test (e.g. treadmill testing) at the end of the observation period or scheduled to be conducted in an outpatient service within 72 hours (Farkouh 1998; Than 2014). Two trials incorporated up-front cardiac magnetic resonance imaging in the intervention group (Miller 2010; Miller 2013). Two trials used a standardised-care protocol for the usual-care group; all usual-care participants received scheduled biomarker testing and observation in traditional hospital ward services (Roberts 1997; Than 2014). For the remaining trials, allocation to the usual-care group warranted admission to coronary care, a telemetry unit, a cardiology service or general floor, and non-standardised treatment (Farkouh 1998; Gomez 1996; Rydman 1997) or usual-care procedures (Miller 2010; Miller 2013).

Trials randomising participants with heart failure

Participants: the mean age of participants in the single trial that included people with decompensated heart failure was 77 years in the intervention group compared with 79 years in the usual-care group, and slightly more men were included (men in short-stay unit versus usual-care group: 54% versus 61%) (Chivite 2008).

Interventions: one trial compared short-stay unit hospitalisation with hospitalisation in an internal medicine service for management of acute decompensated heart failure in older participants; an older person was defined as aged 65 years or older (Chivite 2008). It was a single-centre trial reported in abstract format.

Trials randomising participants with syncope

Participants: two trials randomised participants with syncope, stratified to be at 'intermediate' risk for an adverse cardiovascular outcome or a serious outcome. The mean age of participants ranged from 64 to 65 years in both groups, and the trials included equal proportions of men and women (range of proportion of men in short-stay unit versus usual-care group: 47% to 49% versus 48% to 52%) (Shen 2004; Sun 2014).

Interventions: two trials compared short-stay unit hospitalisation with inpatient care for management of participants with syncope. One was a single-centre trial that compared hospitalisation in a short-stay unit with conventional care (Shen 2004). Participants in the intervention group underwent six-hour monitoring, scheduled orthostatic blood pressure measurements, tilt table test, carotid sinus massage and electrophysiologist consultation upon a physician's request. Participants with no indication for further hospitalisation were offered an outpatient follow-up consultation 72 hours after discharge. The other was a multicentre trial conducted at five hospitals that compared hospitalisation in a short-stay unit with standard hospital admission. Participants allocated to the intervention group received 12 to 24 hours of cardiac monitoring, scheduled biomarker testing and an echocardiogram (Sun 2014). In both of the trials, the usual-care groups received non-standardised care at the discretion of the responsible physicians (Shen 2004; Sun 2014).

Trials randomising participants with transient ischaemic attack

Participants: the mean age of participants in the single trial with people with transient ischaemic attach was 68 years in both groups, and there were more women than men (proportion of men in short-stay unit versus usual-care group: 41% versus 46% (Ross 2007).

Interventions: one, single-centre trial compared short-stay unit hospitalisation with inpatient care (primarily stroke unit, or internal medicine ward) for management of an episode of transient ischaemic attack (Ross 2007). Participants randomised to the intervention group received cardiac monitoring for at least 12 hours, carotid imaging, echocardiography, and serial clinical evaluations by nurses and emergency physicians, and a neurologist consultation. The usual-care group received non-standardised care at the discretion of the responsible physicians.

Trials randomising participants with miscellaneous internal medicine diseases or conditions

Participants: the mean age of participants in the single trial that did not define a specific disease or condition was 81 years in the intervention group compared with 82 years in the usual-care group, and more men were included in the intervention group (proportion of men in short-stay unit versus usual-care group: 47% versus 41%) (Strøm 2017a).

Interventions: one single-centre trial compared short-stay unit hospitalisation with hospitalisation in an internal medicine department in participants aged 75 years or older (Strøm 2017a). Participants randomised to the intervention group did not received a standardised treatment protocol, but discharge planning was initiated immediately after admission to the short-stay unit, and further diagnostic tests were performed on the same terms as in the emergency department, on a fast-track basis; including point-of-care ultrasonography, acute blood samples analysed in the emergency department's point-of-care laboratory, simple X-rays in the emergency department's X-ray room, and CT or MRI scans at the Department of Radiology. Participants were encouraged to mobilise as much as possible without assistance during the stay, which included getting minimal help to basic self-care activities such as bathing, getting out of bed, or walking around the department. The usual-care group was treated as usual at an internal medicine department.

For further details of each trial, see 'Characteristics of included studies'.

Funding

Thirteen trials described funding and financial support in detail (Table 1). Two trials were at risk of funding bias because a company with a potential financial interest in a certain result of the trials funded the trial authors (Miller 2010; Miller 2013).

Excluded studies

We excluded 81 trials and studies after full-text assessment based on our inclusion and exclusion criteria. Twenty-three trials did not assess short-stay unit hospitalisation as an intervention, 52 studies were excluded due to ineligible study design (two of these were quasi randomised trials randomising days not participants to short-stay unit care or usual care), one was a commentary, two trials used a ineligible comparator, one trial included an ineligible study population, and two reports turned out to be duplicates that were not identified in the primary selection process. For further details see 'Characteristics of excluded studies'.

On-going studies

We identified one ongoing study (NCT03302910). The trial was commenced one week prior to the date of the search; hence, no results were available for the current review. The trial is a multicentre trial comparing short-stay unit hospitalisation with usual care for treatment of acute heart failure. Participants are assigned to the short-stay unit for a treatment and observation period. Participants in both the short-stay unit and usual care arm receive usual medical care for acute heart failure, which includes loop diuretics and nitroglycerine, as needed. The timeframe for maximum stay in the trial is set to 23 hours (NCT03302910).

Risk of bias in included studies

Allocation

We assessed the generation of the allocation sequence generation as low risk of bias in 10 trials (Chivite 2008; Decker 2008; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Shen 2004; Strøm 2017a; Sun 2014; Than 2014). Four trials described themselves as being randomised, but the methods used for sequence generation were unclear (Farkouh 1998; Gomez 1996; McDermott 1997; Rydman 1997), so we judged these trials to be of unclear risk of bias for this domain. We converted one trial from having unclear risk of bias to having low risk of bias in this domain after contact with the trial authors (Chivite 2008).

The method used to conceal allocation was adequate in 11 trials (Chivite 2008; Gomez 1996; Decker 2008; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Shen 2004; Strøm 2017a; Sun 2014; Than 2014), so we judged these trials to be at low risk of bias for this domain. The remaining three trials either did not describe the method used for allocation concealment or insufficiently described it (Farkouh 1998; McDermott 1997; Rydman 1997), and we judged these trials to be at unclear risk of bias for the domain. We converted one trial from having unclear risk of bias to having low risk of bias in this domain after contact with the trial authors (Chivite 2008).

Baseline outcome measurement

We assessed baseline outcome measurement as low risk of bias in 12 trials (Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004; Strøm 2017a; Than 2014), because they measured relevant performance or patient outcomes prior to the intervention and no important differences were present across trial groups, or baseline outcome measurement was irrelevant for all trial outcomes. Two trials did not specify any information on baseline outcome measurement (Chivite 2008; Sun 2014), and we judged the trials to have unclear risk of bias for this domain.

Baseline characteristics

We assessed baseline characteristics as low risk of bias in 12 trials (Chivite 2008; Gomez 1996; Farkouh 1998; McDermott 1997; Miller 2010; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004; Strøm 2017a; Sun 2014; Than 2014). We judged one trial to be at high risk of bias for this domain (Miller 2010), because characteristics were imbalanced (cardiac events prior to hospitalisation were unevenly distributed), and one trial at unclear risk of bias (Decker 2008).

Blinding

Risk of performance bias was present in all 14 trials (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004; Strøm 2017a; Sun 2014; Than 2014), because it was impossible to blind participants and healthcare personnel due to the nature of the intervention.

We assessed the blinding of outcome assessors as low risk of bias in two trials (McDermott 1997; Than 2014). The methods for blinding of outcome assessors for the remaining trials were either inadequate (Chivite 2008; Miller 2010; Miller 2013; Ross 2007; Shen 2004; Sun 2014) - we judged these trials to be at high risk for this domain - or insufficiently described (Decker 2008; Farkouh 1998; Gomez 1996; Roberts 1997; Rydman 1997; Strøm 2017a) - we judged these trials to be at high risk for this domain.

Incomplete outcome data

We assessed trials' handling of incomplete outcome data as low risk of bias in nine trials (Decker 2008; Farkouh 1998; Gomez 1996; Miller 2010; Roberts 1997; Ross 2007; Rydman 1997; Strøm 2017a; Than 2014). We judged three trials to have unclear risk of bias in this domain (McDermott 1997; Shen 2004; Sun 2014). Two trials either did not describe missing data or provided insufficient detail about how they dealt with them (McDermott 1997; Shen 2004)

The remaining trials were judged to be at high risk of bias for this domain (Chivite 2008; Miller 2013). Two trials were stopped early (Miller 2013; Shen 2004). One trial did not calculate a sample size but included consecutive participants until the end of the funding (Chivite 2008). Numbers of participants lost to follow-up in Chivite 2008 varied depending on the outcome in that trial.

Contamination

We did not assess any of the trials to be at low risk of bias for contamination. We judged three trials to be at unclear risk of bias for this domain (Chivite 2008; McDermott 1997; Rydman 1997).

Selective reporting

We assessed selective outcome reporting as low risk of bias in four trials (Miller 2010; Miller 2013; Strøm 2017a; Sun 2014). One trial paper did not report upon the outcomes stated in the protocol (Than 2014), outcome details were provided after correspondence with the trial authors and we judged the trial to be at unclear risk of bias. We were unable to obtain the trial registration or protocol for nine trials that were all conducted before trial registration became mandatory in 2005 (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Roberts 1997; Ross 2007; Rydman 1997; Shen 2004); we judged these trials to be at high risk of bias for this domain.

Other potential sources of bias

Seven trials had no other biases, resulting in 'low risk of other bias' (Decker 2008; Farkouh 1998; Gomez 1996; Rydman 1997; Shen 2004; Strøm 2017a;Than 2014). Three trials were judged to be at 'high risk of other bias', In two trials, the authors were industry-funded (Miller 2010; Miller 2013). In one trial, no sample size was calculated, consecutive participants were included until the end of the funding (Chivite 2008). The remaining trials we judged to be at 'unclear risk of other bias' (McDermott 1997; Roberts 1997; Ross 2007; Sun 2014).).

Overall risk of bias

Based on our predefined 'Risk of bias' assessment and the information that we collected from the published reports and from trial authors, we considered all 14 trials at high risk of bias overall. We judged many trials to be at unclear risk of bias in several domains. For review authors' judgements about each risk of bias item presented as percentages across all included trials see Figure 2, and for review authors' judgements about each 'Risk of bias' item for each included trial see Figure 3.

Effects of interventions

See: **Summary of findings for the main comparison** Short-stay unit hospitalisation compared with usual care for internal medicine diseases and conditions

Primary outcomes

Mortality

Time point closest to 90 days

Twelve trials with a total of 2619 participants reported mortality at the time point closest to 90 days (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Shen 2004; Strøm 2017a; Sun 2014; Than 2014). Nine trials reported data based on an intention-to-treat population (Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Shen 2004; Sun 2014). In 26 of

2619 participants (1%), information on mortality was missing or participants were lost to follow-up (Chivite 2008; Strøm 2017a; Than 2014). In total, 29 of 1290 short-stay unit participants (2%), died compared with 40 of 1303 usual-care participants (3%). Data including the specific assessment time points closest to 90 days in each trial are presented in Table 4.

We were able to pool only five trials in the meta-analysis (Chivite 2008; Farkouh 1998; McDermott 1997; Shen 2004; Strøm 2017a), because seven trials reported no deaths in either group (Decker 2008; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Sun 2014; Than 2014). It is uncertain whether there is any difference in mortality at 90 days for participants hospitalised in short-stay units compared to usual care (RR 0.73, 95% CI 0.47 to 1.15; participants = 1294; studies = 5; I^2 = 0%, very low-certainty evidence, random-effects meta-analysis; Analysis 1.1). Neither visual inspection of the forest plots nor the tests for statistical heterogeneity (I^2 = 0%; P = 0.18) indicated significant heterogeneity. Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias alone had the potential to influence the results. Best-worst random-effects meta-analysis: RR 0.57 (95% CI 0.37 to 0.87; participants = 1318; studies = 5; I^2 = 0%, very low-certainty evidence; Analysis 1.2), and worst-best random-effects meta-analysis: RR 1.05 (95% CI 0.57 to 1.94; participants = 1318; studies = 5; I^2 = 16%, very low-certainty evidence; Analysis 1.3). We imputed data for two trials (Chivite 2008; Strøm 2017a). None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 1.4; Analysis 1.5) or subgroup differences (Analysis 1.6; Analysis 1.7; Analysis 1.8).

Using GRADE, we assessed the certainty of the evidence to be very low for mortality. We considered mortality to be an objective outcome at low risk of bias, i.e., lack of blinding of participants, personnel and outcome assessors may not bias the outcome as much. However, we downgraded the outcome one level for risk of bias due to all the trials being at high risk of bias in the GRADE assessment. The reason for the GRADE judgement is outlined in Appendix 4 and in Summary of findings for the main comparison.

Time point at maximum follow-up

Twelve trials with a total of 2619 participants reported mortality at maximum follow-up (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Shen 2004; Strøm 2017a; Sun 2014; Than 2014). Seven trials reported data based on an intention-to-treat population (Decker 2008; Gomez 1996; McDermott 1997; Miller 2013; Roberts 1997; Shen 2004; Sun 2014). In a total of 44 of 2619 participants (2%), information on mortality was missing or participants were lost to follow-up (Chivite 2008; Farkouh 1998; Miller 2010; Strøm 2017a; Than 2014). A total of 66 of 1281 short-stay unit participants (5%) died compared with 79 of 1294 usual-care participants (6%). Data including the specific assessment time points in each trial are presented in Table 5.

We were only able to pool five of the 12 trials in the meta-analysis for the same reasons stated in the 90-day analysis (Chivite 2008; Farkouh 1998; McDermott 1997; Shen 2004; Strøm 2017a). It is uncertain whether there is any difference in mortality at maximum follow-up for participants hospitalised in short-stay units compared to usual care (RR 0.84, 95% CI 0.62 to 1.13; participants = 1277; studies = 5; I^2 = 0%, very low-certainty evidence, random-effects meta-analysis; Analysis 1.9). Neither visual inspection of the forest plots nor tests for statistical heterogeneity (I^2 = 0%; P = 0.80) indicated significant heterogeneity. Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias alone had the potential to influence the results. Best-worst random-effects meta-analysis: RR 0.67 (95% CI 0.50 to 0.88; participants = 1318; studies = 5; I^2 = 0%, very low-certainty evidence; Analysis 1.10), and worst-best random-effects meta-analysis: RR 1.17 (95% CI 0.73 to 1.89; participants = 1318; studies = 5; I^2 = 35%, very low-certainty evidence; Analysis 1.11). We imputed data for three trials (Chivite 2008; Farkouh 1998; Strøm 2016). None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 1.12; Analysis 1.13) or subgroup differences (Analysis 1.14; Analysis 1.15; Analysis 1.16).

Serious adverse events

None of the trials used the exact term ‘serious adverse events’. However, the trials reported a number of composite outcomes that we propose reflect serious adverse events according to the ICH-GCP definition (ICH-GCP 1997). One trial that recruited participants with atrial fibrillation reported a composite outcome of acute myocardial infarction, heart failure, stroke, or death (Decker 2008). A trial that recruited participants with chest pain used similar criteria, but added out-of-hospital cardiac arrest as a criterion (Farkouh 1998). Two other trials that recruited participants with chest pain were conducted by the same research group (Miller 2010; Miller 2013). In Miller 2010, trial authors reported major cardiac events defined by any of the following: myocardial infarction, revascularization, or cardiovascular death. In Miller 2013, trial authors reported safety events defined to be either death, acute coronary syndrome after discharge, or adverse events of cardiac stress testing. A further trial that recruited chest pain participants used the term 'major adverse cardiac event' to cover any of the following: cardiac death, cardiac arrest, emergency revascularization procedure, cardiogenic shock, ventricular arrhythmia needing intervention, high-degree atrioventricular block needing intervention, or myocardial infarction (Than 2014). In a trial that recruited participants with transient ischaemic attack, trial authors used the recorded subsequent stroke within 90 days, major clinical events (seizures, foramen ovale closure etc.), and major adverse cardiac events (major dysrhythmia, new myocardial infarction, cardiac arrest, revascularisation, new congestive heart failure, cardiac death; Ross 2007). A trial that recruited participants with syncope reported serious clinical events, defined to be any of the following: death, ventricular arrhythmia, heart block, sick sinus syndrome, sinus pause greater than three seconds, symptomatic supraventricular tachycardia, symptomatic bradycardia, major cardiac intervention, myocardial infarction, stroke, pulmonary embolism, aortic dissection, non-traumatic intracranial haemorrhage, internal haemorrhage or anaemia requiring transfusion, and major traumatic injury associated with syncope, near-syncope or fall (Sun 2014). One trial that recruited older participants with miscellaneous internal medicine diseases

and conditions reported deaths during the index hospital stay (Strøm 2017a).

Time point closest to 90 days

Eight trials with a total of 2039 participants reported serious adverse events at the time point closest to 90 days (Decker 2008; Farkouh 1998; Miller 2010; Miller 2013; Ross 2007; Strøm 2017a; Sun 2014; Than 2014). Four trials reported data based on an intention-to-treat population (Decker 2008; Farkouh 1998; Miller 2013; Ross 2007). In a total of 24 of 2039 participants (1%), information regarding serious adverse events was missing or participants were lost to follow-up (Miller 2010; Strøm 2017a; Sun 2014; Than 2014). A total of 76 of 1002 short-stay unit participants (8%) had a serious adverse event compared with 74 of 1013 of usual-care participants (7%). Data including the specific assessment time points in each trial are presented in Table 6.

We were able to pool seven of the eight trials in the meta-analysis (Decker 2008; Farkouh 1998; Miller 2013; Ross 2007; Strøm 2017a; Sun 2014; Than 2014); Miller 2010 reported zero serious adverse events. It is uncertain whether there is any difference in serious adverse events at 90 days for participants hospitalised in short-stay units compared to usual care (RR 0.95, 95% CI 0.59 to 1.54; participants = 1907; studies = 7; I^2 = 34%, very low-certainty evidence, random-effects meta-analysis; Analysis 2.1). The visual inspection of the forest plots and the tests for statistical heterogeneity (I2 = 34%; P = 0.16) indicated moderate statistical heterogeneity; hence, the included trials in the SAE meta-analysis seem to show different intervention effect estimates. This might be cause by differences in the trial interventions, participant characteristics, different co-interventions, definitions of serious adverse events etc. in the included trials. There is a risk that pooling these trials in a meta-analysis for serious adverse events may produce a misleading result.

Investigation of the forest plots showed that one trial alone could have accounted for the statistical heterogeneity. When we removed Farkouh 1998, heterogeneity was also removed, both visually and statistically (RR 1.23, 95% CI 0.88 to 1.72; participants = 1483; studies = 6; I^2 = 0%; Analysis 2.18). Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias did not have the potential to influence the results. Best-worst random-effects meta-analysis: RR 0.79 (95% CI 0.50 to 1.26; participants = 1929; studies = 7; I^2 = 37%, very low-certainty evidence; Analysis 2.2), and worst-best random-effects meta-analysis: RR 1.13 (95% CI 0.67 to 1.89; participants = 1929; studies = 7; I^2 = 46%, very low-certainty evidence; Analysis 2.3). We imputed data for three trials (Strøm 2017a; Sun 2014; Than 2014). None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 2.4; Analysis 2.5) or subgroup differences (Analysis 2.6; Analysis 2.7; Analysis 2.8).

Using GRADE, we assessed the certainty of the evidence to be very low for serious adverse events. We considered serious adverse events to be an objective outcome at low risk of bias. However, we downgraded the outcome one level for risk of bias due to all the trials being at high risk of bias in the GRADE assessment. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Time point at maximum follow-up

In total, eight trials with a total of 2039 participants reported serious adverse events at maximum follow-up (Decker 2008; Farkouh 1998; Miller 2010; Miller 2013; Ross 2007; Strøm 2017a; Sun 2014; Than 2014). Three trials reported data based on an intention-to-treat population (Decker 2008; Miller 2013; Ross 2007). In a total of 51 of 2039 participants (3%), information regarding serious adverse events was missing or participants were lost to follow-up (Farkouh 1998; Miller 2010; Strøm 2017a; Sun 2014; Than 2014). A total of 117 of 989 short-stay unit participants (12%) had a serious adverse event compared with 108 of 999 usual-care participants (11%). Maximum follow-up ranged from length of the stay in hospital to an observation-time median of 5.5 years (interquartile range (IQR) 4.8 to 6 years) among trials. Data including the specific assessment time points at maximum follow-up in each trial are presented in Table 7.

We were able to pool data from all eight trials (Decker 2008; Farkouh 1998; Miller 2010; Miller 2013; Ross 2007; Strøm 2017a; Sun 2014; Than 2014). It is uncertain whether there is any difference in serious adverse events at maximum follow-up for participants hospitalised in short-stay units compared to usual care (random-effects meta-analysis: RR 1.11, 95% CI 0.87 to 1.41; participants = 1988; studies = 8; I^2 = 0%, very low-certainty evidence; Analysis 2.9). Neither visual inspection of the forest plots nor tests for statistical heterogeneity (I^2 = 0%; P = 0.73) indicated significant heterogeneity. Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias had the potential to influence the results. Best-worst random-effects meta-analysis: RR 0.83 (95% CI 0.60 to 1.16; participants = 2039; studies = 8; I^2 = 30%, very low-certainty evidence; Analysis 2.10), and worst-best random-effects meta-analysis: RR 1.35 (95% CI 1.07 to 1.70; participants = 2039; studies = 8; I^2 = 0%, very low-certainty evidence; Analysis 2.11). We imputed data for five trials (Farkouh 1998; Miller 2010; Strøm 2017a; Sun 2014; Than 2014). None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 2.12; Analysis 2.13) or subgroup differences (Analysis 2.14; Analysis 2.15; Analysis 2.16).

Secondary outcomes

Quality of life

Time point closest to 90 days

Four trials with a total of 1029 participants recorded quality of life at the time point closest to 90-days (Chivite 2008; McDermott 1997; Sun 2014; Than 2014). None of the trials reported results based on an intention-to-treat population. Data were missing in 206 of 1029 participants (20%). Data and a further description of scoring systems are presented in Table 8.

None of the trials reported quality of life using the same measurement tool, hence we could not pool data in meta-analyses.

Chivite 2008 reported quality of life using the Minnesota Living With Heart Failure Scale in 59 of 70 participants (84%) in the intervention group and in 59 of 69 participants (86%) in the usual-care group. Participants in the intervention group had marginally higher mean scores at three months; mean 23 (SD 9) in the intervention group compared with 22 (SD 9) in the usual-care group.

McDermott 1997 reported quality of life using The Short Form-36 Health Survey (SF-36). The trial reported all the eight separate domains of the SF-36 for a subgroup of participants (113/222 (51%)), it was not clear how the subgroup had been selected. Trial authors reported that participants in the intervention group had significantly better outcomes in the physical, emotional role, social functioning, mental health, and vitality domains at seven days after randomisation (Mean SF-36 domains in intervention group versus usual-care groups with P-values: physical functioning 72 (27.43) versus 58 (29.04), P = 0.01; emotional functioning role 78 (51.31) versus 45 (44.62), P = 0.001; social functioning 80 (27.95) versus 68 (29.27), P = 0.02; mental health 78 (19.44) versus 67 (26.00), P = 0.008, and vitality 59 (22.99) versus 47 (25.73), P = 0.02).

Sun 2014 reported quality of life using change in Quality of Well Being Scale and the Syncope Functional Status Questionnaire in 46 of 62 participants (74%) in the intervention group and in 41 of 62 participants (66%) in the usual-care group. The MD in Quality of Well Being score was -0.02 (95% CI -0.10 to 0.06) and MD in depression score was -5.2 (95% CI -15.2 to 4.8), in favour of the intervention group.

Than 2014 reported quality of life using the EuroQol-5 Domain (EQ5D). Trial authors did not include quality of life in the primary publication, but stated that 253 of 270 participants (94%) in the intervention group compared with 250 of 272 participants (92%) in the usual-care group completed an EQ5D at three months after inclusion. The mean scores in the intervention group versus the usual-care group were: 0.728 (standard deviation (SD) 0.09) versus 0.716 (SD 0.10).

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for quality of life. We considered this outcome at high risk of bias. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Time point at maximum follow-up

One of the above mentioned trials (in 'Quality of life time point closest to 90 days') obtained quality of life at a longer-term follow-up (Chivite 2008) for 48 of 70 participants (69%) in the intervention group and for 47 of 69 participants (68%) in the usual-care group. The trial reported quality of life at 12 months, using the Minnesota Living With Heart Failure Scale. Participants in the two groups had equal mean scores at 12 months; mean 22 (SD 12) in the intervention group compared with 22 (SD 12) in the usual-care group. Data were missing in 44 of 139 (32%) participants in Chivite 2008. Publication bias was not assessable.

Activities of daily living

Time point closest to 90 days

Two trials with a total of 569 participants recorded activities of daily living scores (Chivite 2008; Strøm 2017a). Neither of the trials conducted intention-to-treat analysis for activities of daily living. In one trial, information was missing for 21 of 139 participants (15%), for unknown reasons. In the other trial, information was missing for 89 of 430 participants (21%); of these 54 (13%) died before the 90-day follow-up (Strøm 2017a). Neither of the trials were published. Chivite 2008's authors stated that they had never sought to publish the trial. They used Older Americans Resources and Services instrumental Activities of Daily Living-score (OARS-iADL; Pfeiffer 1978). Strøm 2017a was completed and the trial paper submitted for peer review. The trial authors used Lawton's Instrumental Activities of Daily Living Scale (Lawton's iADL; Lawton 1969).

The OARS-iADL Questionnaire consists of seven questions administered by a rater who solicits a self-report response from the participant, assessing different activities of daily living tasks; use of telephone, transportation, shopping, meal preparation, housework, medications, and money management. For each question, the participant responds by indicating whether the task can be performed independently, with some assistance, or not at all. Each domain is assessed on a 0 to 2 scale, giving a range of 0 to 14 (14 represents complete independence in all and 0 complete dependence).

The Lawton IADL score assesses eight independent living skills (ability to use telephone, shopping, food preparation, housekeeping, laundering, transportation, responsibility for own medications, and ability to handle finances. Participants are scored according to their highest level of functioning in that category (score of 0 or 1 per domain). A summary score ranges from 0 (low function, dependent) to 8 (high function, independent).

We were not able to pool the results for activities of daily living in a meaningful meta-analysis.

Chivite 2008 reported that the intervention group had a lower mean OARS-iADL score at 90 days (mean score 8 (SD 8), 59 of 70 randomised participants (84%)) than the usual-care group (mean score 9 (SD 3), 59 of 69 randomised participants (86%); MD -1.00, 95% CI -3.18 to 1.18).

Strøm 2017a reported that the median Lawton iADL score was 8 (IQR 6 to 8) in the intervention group and 8 (IQR 5 to 8) in the usual-care group at day 90 from admission. The MD was -0.36 (95% CI -0.81 to 0.9). Six participants (3%) in the intervention group and 35 participants (20%) in the usual-care group experienced a reduction in iADL-score at 90 days from admission. Nineteen participants (10%) in the intervention group and nine participants (5%) in the usual-care group had increased iADL-scores.

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for activities of daily living. We considered this outcome at high risk of bias. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Time point at maximum follow-up

Chivite 2008 recorded iADL score at a longer-term follow-up. At 12-months, the intervention group had lower mean OARS-iADL score (MD -1.00, 95% CI -3.18 to 1.18 (intervention group: mean score 7 (SD 3), 48/70 (69%) randomised participants; usual-care group: mean score 8 (SD 4), 47/69 (68%) randomised participants). Information was missing in 44 of 139 (32%) participants for unknown reasons. Publication bias was not assessable.

Hospital readmission

Time point closest to 90 days

Nine trials, with a total of 2219 participants, recorded the proportion of participants who were readmitted to hospital after index hospitalisation at the time point closest to 90 days (Chivite

2008; Decker 2008; Farkouh 1998; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Strøm 2017a; Than 2014). Five trials reported results based on the intention-to-treat population (Decker 2008; Miller 2010; Miller 2013; Roberts 1997; Ross 2007). In a total of 466 of 2219 participants (21%), information regarding hospital readmission was missing or participants were lost to follow-up (Chivite 2008; Farkouh 1998; Strøm 2017a; Than 2014). When excluding Farkouh 1998, results were missing in 42 of 2219 participants (2%). A total of 110 of 873 short-stay unit participants (13%) were readmitted after index hospitalisation compared with 147 of 880 usual-care participants (17%). Data including the specific assessment time points closest to 90 days in each trial are presented in Table 9.

We were able to pool eight of the nine trials in the meta-analysis; one trial did not report the outcome numbers (Farkouh 1998 reported revisits to emergency department for cardiac problems, but no information on revisits that led to hospital readmission). It is uncertain whether there is any difference in hospital readmission at the time point closest to 90 days for participants hospitalised in short-stay units compared to usual care (RR 0.80, 95% CI 0.54 to 1.19; participants = 1753; studies = 8; I^2 = 57%, very low-certainty evidence, random-effects meta-analysis; Analysis 3.1). The visual inspection of the forest plots and the tests for statistical heterogeneity (I^2 = 57%; P = 0.02) indicated substantial heterogeneity. Investigation of the forest plots showed that one trial alone could have accounted for the statistical heterogeneity. When we removed Strøm 2017a, heterogeneity was reduced, both visually and statistically (RR 0.98, 95% CI 0.73 to 1.31; participants = 1351; studies = 7; I^2 = 9%; Analysis 3.17). Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias alone did not have potential to influence the results. Best-worst random-effects meta-analysis: RR 0.72 (95% CI 0.48 to 1.09; participants = 1795; studies = 8; I^2 = 64%, very low-certainty evidence; Analysis 3.2), worst-best random-effects meta-analysis: RR 0.93 (95% CI 0.67 to 1.29; participants = 1795; studies = 8; I^2 = 45%, very low-certainty evidence; Analysis 3.3). We imputed data for three trials (Chivite 2008; Strøm 2017a; Than 2014). We did not include Farkouh 1998 due to the lack of information. None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 3.4; Analysis 3.5) or subgroup differences (Analysis 3.6; Analysis 3.7; Analysis 3.8).

Using GRADE, we assessed the certainty of the evidence to be very low for hospital readmission. We considered readmission to be an objective outcome. However, we downgraded the outcome one level for risk of bias due to all the trials being at high risk of bias in the GRADE assessment. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Time point at maximum follow-up

Nine trials, with a total of 2219 participants, obtained the proportion of participants who were readmitted to hospital after index hospitalisation at maximum follow-up (Decker 2008; Chivite 2008; Farkouh 1998; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Strøm 2017a; Than 2014). Four trials reported results based on the intention-to-treat population (Decker 2008; Miller 2013; Roberts 1997; Ross 2007). In a total of 488 of 2219 participants (22%), information regarding hospital readmission was missing or participants were lost to follow-up (Chivite 2008; Farkouh 1998; Miller 2010; Strøm 2017a; Than 2014). When we excluded Farkouh 1998, results were only missing in 64 of 2219 of participants (3%). A total of 122 of 860 short-stay unit participants (14.2%) were readmitted after index hospitalisation compared with 171 of 871 usual-care participants (20%). Data including the specific assessment time points at maximum follow-up in each trial are presented in Table 10.

We were able to pool eight of the nine trials in the meta-analysis; one trial did not report the outcome numbers (Farkouh 1998 reported revisits to emergency department for cardiac problems, but no information on revisits that led to hospital readmission). It is uncertain whether there is any difference in hospital readmission at maximum follow-up for participants hospitalised in short-stay units compared to usual care (RR 0.75, 95% CI 0.51 to 1.10; participants = 1731; studies = 8; I^2 = 65%, very low-certainty evidence, random-effects meta-analysis; Analysis 3.9). Visual inspection of the forest plots and the test for statistical heterogeneity (I^2 = 65%; P = 0.005) indicated significant heterogeneity. Contrary to the analysis at the time point of 90 days, no single trial could account for the statistical heterogeneity when investigating forest plots. When we removed Strøm 2017a, heterogeneity was only marginally reduced (RR 0.85, 95% CI 0.59 to 1.22; participants = 1329; studies = 7; I^2 = 48%; Analysis 3.18), but when we also removed Miller 2010, heterogeneity was removed, both visually and statistically (RR 1.01, 95% CI 0.79 to 1.30; participants = 1220; studies = 6; I^2 = 0%; Analysis 3.19). Publication bias was not assessable (fewer than 10 trials in the meta-analysis).

The best-worst and worst-best case meta-analyses showed that incomplete outcome data bias alone had the potential to influence the results. Best-worst random-effects meta-analysis: RR 0.65 (95% CI 0.45 to 0.94; participants = 1795; studies = 8; I^2 = 65%, very low-certainty evidence; Analysis 3.10), worst-best random-effects meta-analysis: RR 0.88 (95% CI 0.59 to 1.33; participants = 1795; studies = 8; I^2 = 73%, very low-certainty evidence; Analysis 3.11). We imputed data for four trials (Chivite 2008; Miller 2010; Strøm 2017a; Than 2014). We did not include Farkouh 1998 due to the lack of information. None of the additional analyses showed evidence of important influence of the investigated factors (trial publication status, time point of outcome assessment; Analysis 3.12; Analysis 3.13) or subgroup differences (Analysis 3.14; Analysis 3.15; Analysis 3.16).

Non-serious adverse events

Time point closest to 90 days and time point at maximum follow-up

Two trials, with a total of 533 participants, recorded non-serious adverse events (Shen 2004; Strøm 2017a). We were not able to pool the results for non-serious adverse events in a meaningful meta-analysis.

Shen 2004 obtained intention-to-treat data for non-serious adverse events and found no non-serious adverse events in either the intervention group or the usual-care group (Shen 2004).

Strøm 2017a excluded 12 of 430 participants (3%), due to inclusion errors or withdrawals and did not impute data for those participants (seven in intervention group compared with five in usual-care group). Sixteen participants (8%) in the intervention

group and 45 participants (21%) in the usual-care group experienced at least one adverse event during hospitalisation (OR 0.31; 95% CI 0.17 to 0.56; P < 0.001). Trial authors did not distinguish between whether the events were non-serious or serious. There was one time point assessment.

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for non-serious adverse events. We considered this outcome at high risk of bias. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Transfer to another department

Time point closest to 90 days and time point at maximum follow-up

One trial with a total of 430 participants reported transfers to other departments after initial placement in a short-stay unit or a usual-care unit; 47 (23%) in the intervention group compared with 31 (15%) in the usual-care group were transferred to another treatment facility during hospitalisation (OR 1.69; 95% CI 1.02;1.18, 418/430 participants analysed) (Strøm 2017a).

Seven trials with 1429 participants reported all admissions to in-hospital wards (other than short-stay units) (McDermott 1997; Miller 2010; Roberts 1997; Ross 2007; Shen 2004; Sun 2014; Than 2014); however, as usual care usually consisted of admission to an in-hospital ward, we found the comparison between short-stay unit hospitalisation and usual care unreasonable and we have just reported findings. Six trials reported admissions for the intention-to-treat population (McDermott 1997; Miller 2010; Roberts 1997; Ross 2007; Shen 2004; Sun 2014).

We grouped by condition the proportions (%) of participants in the intervention group versus the usual-care group who were admitted to in-hospital wards other than short-stay units:

- asthma: 41% versus 100% (McDermott 1997)
- chest pain: 45.1% versus 100% (Miller 2010); 21% versus 95% (Roberts 1997); 13% versus unclear (Than 2014)
- syncope: 43% versus 98% (Shen 2004); 15% versus 92% (Sun 2014)
- transient ischaemic attack: 15% versus 100% (Ross 2007).

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for serious adverse events. We considered this outcome at high risk of bias. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison.

Length of stay in hospital

We obtained data on length of stay in hospital from 12 trials, including 2224 participants (Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Shen 2004; Strøm 2017a; Sun 2014). Seven trials conducted intention-to-treat analysis for total length of stay in hospital (Chivite 2008; Decker 2008; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Ross 2007). Data were missing in at least 44 of 2226 participants (2.0%) (McDermott 1997; Shen 2004; Strøm 2017a; Sun 2014). The number of participants that were evaluated and missing was not available in one trial that randomised 424 participants (Farkouh 1998).

We did not perform meta-analyses for numerous reasons. First of all, sample sizes of individual trials were rather small and we suspected that the distribution of values was skewed. It was inappropriate to use median values directly in a meta-analysis (Higgins 2011d, chapter 7.7.3.5). We were not able to collect appropriate data summaries or individual participant data from all trial authors in order to handle data on a transformed scale, such as a log scale, which potentially could reduce skew (Deeks 2011, chapter 9.4.5.3). Furthermore, two of the trials exclusively reported mean or median length of stay in hospital for selected subgroups (McDermott 1997; Shen 2004). One trial reported the mean length of stay in hospital exclusively for participants transferred to an in-hospital ward; that is, any hospital ward other than short-stay unit, during their hospital stay (43% of the intervention group compared with 99% of the usual-care group; Shen 2004). The average length of stay in hospital was longest in the intervention group (70 hours in the intervention group compared with 65 hours in the usual-care group; Shen 2004). One trial reported the mean length of stay in hospital for the intervention group by two subgroups; that is, participants transferred to another in-hospital ward after treatment in the short-stay unit and participants discharged directly from the short-stay unit. They found very short average length of stay in hospital for the discharged short-stay unit-participants (mean 9 hours), but longer stays for the subgroup of the transferred short-stay unit participants (mean 77 hours) in comparison with the usual-care group (mean 59 hours; McDermott 1997). Finally, one trial did not report length of stay in hospital for the usual-care group (Farkouh 1998). The remaining trials reported shorter hospital stays in the intervention groups compared with the usual-care groups; mean or median length of stay in hospital ranged from 9 hours to 96 hours in the intervention groups and from 37 hours to 216 hours in the usual-care groups (Chivite 2008; Decker 2008; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Strøm 2017a; Sun 2014). In two trials, the reported mean or median length of stay in hospital in the intervention group was less than 24 hours (Decker 2008; Gomez 1996). In five trials, the reported mean or median length of stay in hospital in the intervention group was between 24 and 48 hours (Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Sun 2014). In two trials, the reported mean or median length of stay in hospital in the intervention group was between 96 and 120 hours (Chivite 2008; Strøm 2017a); both trials included older participants (aged 65 or 75 years or older, respectively).

For each trial, details on length of stay in hospital measurements and data are presented in Table 11.

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for length of stay. We considered length of stay to be an objective outcome at low risk of bias. However, we downgraded the outcome one level for risk of bias due to all the trials being at high risk of bias in the GRADE assessment. The reason for the GRADE judgement is outlined in Appendix 4.

Comparable costs

Eighttrials, including 1433 participants, reported costs (Chivite 2008; Farkouh 1998; Gomez 1996; McDermott 1997; Miller 2010; Roberts 1997; Ross 2007; Sun 2014). Four trials conducted intention-to-treat analysis for costs (Gomez 1996; Miller 2010; Miller 2013; Ross 2007; Sun 2014). One trial exclusively analysed the first 130 of 222 randomised participants (59%) (McDermott 1997). Two trials did not clearly define the number of included participants in

the cost analyses (Chivite 2008; Farkouh 1998). In the remaining trial, information was missing for one participant (0.01%) (Roberts 1997).

As suspected prior to conducting the review, there was substantial heterogeneity between the assessment of costs in the trials; that is, two trials used the exact same method to calculate costs, and the variability across settings was high; for example, trials used different treatment protocols, there were differences in local pricing and inter-country variability in cost-estimations. All trials indicated that the short-stay unit model had cost-saving properties compared with usual care. Cost measurements are summarised in Table 12. In the following narrative summary of data, we have presented the findings by condition.

Asthma

McDermott 1997 assessed hospital costs for the index hospital stay by a full evaluation of used health care resources during the index hospital stay (e.g. including individual tests and resources used per participant, fixed and variable costs for running the department and hospital, labour expenses). Short-stay unit hospitalisation rather than usual care (inpatient treatment) incurred lower costs for participants with acute exacerbation of asthma. Mean costs (SD) per participant in intervention group compared with usual-care group were USD 1202 (SD USD 1343) compared with USD 2247 (SD USD 1110).

Chest pain

Roberts 1997 assessed hospital costs for the index hospital stay using similar methods to McDermott 1997, in participants with chest pain and low probability of acute myocardial infarction. Mean hospital costs were lower in the intervention group; mean hospital costs per participant (SD) in intervention group compared with usual-care group were USD 1528 (SD USD 1012) compared with USD 2095 (SD USD 2095).

Farkouh 1998 assessed six-month costs related to cardiovascular care in participants with chest pain who were stratified to be at intermediate risk for cardiovascular events in the short term. Costs were derived upon relative-value units for cardiac tests, cardiac procedures, and cardiac hospitalisation. Each unit was given a relative weight, and the weighted frequencies were added together for a summary score for each participant. Trial authors did not present the costs per group, but reported that a participant in the usual-care group would incur, on average, approximately 61% more costs related to cardiac care during a period of six months in comparison with a participant in the intervention group.

Gomez 1996 assessed hospital costs for the index hospital stay and for a follow-up period of 30 days using hospital charges in participants with low-risk chest pain. Calculation of costs was based on itemised hospital accounts of the enrolled participants. Participants in the intervention group had lower index hospital stay charges and 30-day hospital charges as compared with the usual-care group. For the index hospital charges, median charges (IQR) in intervention group compared with usual-care group were USD 895 (USD 712 to USD 991) compared with USD 1488 (USD 1096 to USD 3546). For the 30-day total hospital charges, median charges in intervention group compared with usual-care group (IQR) were USD 904 (USD 731 to USD 1347) compared with USD 1542 (USD 1142 to USD 3845).

Miller 2010 assessed hospital costs for the index hospital stay using hospital charges in participants with intermediate to high-risk chest pain. Trial authors compared a diagnostic protocol including up-front cardiac stress-magnetic resonance imaging (MRI) in a short-stay unit (intervention group) with standard inpatient care (usual-care group). Costs were derived as the sum of hospital and provider costs calculated from itemised hospital charges. The estimated mean difference in direct costs was USD 588 (95% CI USD 336 to USD 811) in favour of the intervention group (median direct costs (IQR) in the intervention group compared with the usual-care group were USD 2062 (USD 1918 to USD 2367) compared with USD 2680 (USD 2408 to USD 3448)). In a one-year follow-up study, trial authors used billing information for cardiac-related healthcare encounters and found that cardiac costs from enrolment through 360 days were lower for the intervention group (median costs (IQR) in short-stay unit-group compared with usual-care group: USD 2186 (USD 1957 to USD 4308) compared with USD 3850 (USD 2669 to USD 9710); Miller 2011).

Heart failure

Chivite 2008 assessed hospital costs for the index hospital stay and total hospital costs during a not-clearly-defined follow-up period in older participants (aged 65 years or older) with acute decompensated heart failure. Trial authors found reduced hospital costs for the index admission in the intervention group; mean total hospital costs (SD) in the intervention group compared with the usual-care group were EUR 779.43 (EUR 573.09) compared with EUR 2311.12 (EUR 1847.46). For total costs in the follow-up period including days of hospital stay, tests, new admissions or emergency department attendance costs including tests, transfers (ambulance costs), mean total costs (SD) were EUR 2488.60 (EUR 956.62) in the intervention group compared with EUR 3574.14 (EUR 1018.95) in the usual-care group (findings obtained after contact with trial authors).

Syncope

Sun 2014 assessed hospital costs for the index hospital stay and total hospital costs within 30 days by imputing US national Medicare mean payments for procedures and observation facility fees to estimate the hospital facility cost per unit of time. The total facility cost for each participant was estimated based on the hospital length-of-stay (time of emergency department-arrival to time of hospital-discharge), and costs of the procedures that were performed were added. An absolute cost reduction of USD 629 was found in the intervention group (95% CI USD -1376 to USD -56). Median index visit hospital costs (IQR) for intervention group compared with usual-care group were USD 1210 (USD 948 to USD 1660) compared with USD 1580 (USD 870 to USD 2390). For hospital costs within 30 days, the difference was lower; that is, USD 479 (95% CI USD -1230 to USD 198).

Transient ischaemic attack

Ross 2007 assessed hospital costs for the index hospital stay and 90-day total costs in participants with transient ischaemic attack. Both median index visit costs and median 90-day total costs were lower in the intervention group. Index hospital stay cost calculations included individual resource use, facility costs, and overhead expenses of running the hospital, but did not include staff costs (physicians, nurses). The 90-day costs were calculated by adding costs related to return visits to the index hospital stay costs. Median index hospital stay costs (IQR) for the intervention group

compared with the usual-care group were USD 864 (USD 726 to USD 1076) compared with USD 1529 (USD 1091 to USD 2306). Median 90-day total hospital costs (IQR) for the intervention group compared with the usual-care group were USD 890 (USD 768 to USD 1510) compared with USD 1548 (USD 1091 to USD 2474).

Publication bias was not assessable. Using GRADE, we assessed the certainty of the evidence to be very low for costs. We considered this outcome at high risk of bias. The reason for the GRADE judgement is outlined in Appendix 4 and Summary of findings for the main comparison

Missing data

We have reported details on missing data for each outcome. Few trials conducted intention-to-treat analysis in all analyses, but overall, trials had very little missing information due to low exclusion or lost-to-follow-up rates.

Unit of analysis issues

We did not identify unit of analysis issues among the included trials.

Assessments of the certainty of the body of evidence

We assessed the certainty of the evidence using the GRADE approach for the results of the most important outcomes at the time point closest to 90 days. GRADE assessments showed that the certainty of the evidence must be regarded as very low despite the body of evidence being from randomised trials. We reduced the certainty ratings because of high likelihood of bias in the included trials, substantial clinical heterogeneity among populations and co-interventions, substantial statistical heterogeneity, indirectness of evidence, or imprecision in the effect estimates (for GRADE assessment details see Summary of findings for the main comparison and Appendix 4).

DISCUSSION

Summary of main results

We included 14 completed trials randomising 2872 adults to either short-stay unit hospitalisation or usual care for internal medicine diseases or conditions. We identified one ongoing trial that was commenced one week prior to the search. Only completed trials were included in our analyses. All trials were at high risk of bias. We assessed the evidence for all outcomes to be of very low certainty. The components of the intervention, short-stay unit hospitalisation, and the participant populations were heterogeneous. We found limited data for all outcomes.

Our analyses showed that it is uncertain whether hospitalisation in short-stay units compared with usual care affects mortality, serious adverse events, or hospital readmission. There was not enough information to confirm or refute that short-stay unit hospitalisation had relevant effects on quality of life, activities of daily living, non-serious adverse events, and costs. We were merely able to compile results for these outcomes in a narrative way, because either the trial authors had used different outcome scoring systems, data were too sparse, or they were presented in an unusable way. Overall, the results of the individual trials indicated time and cost-sparing effects of short-stay unit hospitalisation, and higher quality-of-life scores for participants randomised to short-stay unit hospitalisation. However, it is crucial to validate the findings in larger, well-conducted trials, and one should abstain from spurious interpretations.

Our main results are summarised in Summary of findings for the main comparison.

Overall completeness and applicability of evidence

We were aware that earlier reviews of the literature found problems in identifying trials on short-stay units due to terminology issues. We therefore conducted a broad literature search in close collaboration with a Cochrane Information Specialist (PM). Compared with previous systematic reviews, we identified far more trials (in total 15 trials compared with five to seven trials (Daly 2003; Damiani 2011; Downing 2008; Galipeau 2015). We searched for published and unpublished trials, irrespective of publication type, publication date, publication status, and language. Additionally, we searched the grey literature, and bibliographies of all included trials and earlier systematic reviews to identify missing trials.

The included trials were clinically heterogeneous; there was a large span in participant selection criteria and components of the intervention, short-stay unit hospitalisation. Mostly, the intervention comprised short-stay unit hospitalisation including application of well-defined clinical protocols. The components of the clinical protocols were mainly dictated by the conditions studied in the individual trials. All but one trial clearly described a target time frame for stay in the short-stay unit below 120 hours (five days) with a majority of trials aiming at stays under 24 hours (11 of 14 trials).

We were not able to create funnel plots for detection of publication bias due to limited available data. We identified two unpublished trials; contact with trial authors revealed that one was completed and submitted for peer review (Strøm 2017a) and publication was never sought for the other (Chivite 2008).

We conducted subgroup analyses to explore potential evidence of differences in patient outcomes related to the subtypes of short-stay units (multipurpose units compared with units dedicated to a single condition or disease, units applying protocol-specific co-interventions in short-stay unit compared with no protocol-specific co-interventions) or participant-specific characteristics (younger compared with older participants). None of the subgroup analyses showed evidence of such effects. We observed that missing data had the potential to influence the results of the analyses on mortality, hospital readmission, and serious adverse events; tests of best-worst case scenarios showed a potential effect of short-stay unit hospitalisation on mortality (at the time point closest to 90 days and at maximum follow-up) and hospital readmission (at maximum follow-up), while tests for worst-best case scenarios showed potentially higher risk of adverse events in short-stay unit participants (at maximum follow-up).

We used two time points for outcome assessments: at the time point closest to 90 days and at maximum follow-up. It is always difficult to choose the optimal assessment time point. The observation period needs to be long enough, so that the participants experience events; on the other hand, if the observation period is too long, events not related to the disease or the intervention might dilute the actual trial intervention effects and reduce power. We chose the time point closest to 90 days to be the primary time point of interest, because we anticipated that

many trial participants were likely to have several admissions that could interfere with the intervention effect. Hence, a short-term effect of the intervention would be most reliable.

Our analyses showed that at this point in time, there is not enough information to confirm or refute that short-stay unit hospitalisation has beneficial or harmful effects on mortality, serious adverse events, quality of life, activities of daily living, hospital readmissions, non-serious adverse events, transfer to another department, length of stay in hospital, and costs.

Certainty of the evidence

We assessed the certainty of the evidence for all outcomes (Summary of findings for the main comparison). Despite exclusively including randomised trials, the GRADE assessments showed that the certainty of the evidence was very low for all of the outcomes. Reasons for the GRADE assessments are provided in the footnotes of the Summary of findings for the main comparison.

Potential biases in the review process

Strength and limitations of the review

Strengths

This review was conducted in compliance with Cochrane recommendations (Higgins 2011a). We published the review protocol prior to the first literature search to ensure transparency (Strøm 2016). We conducted the review according to the published protocol (Strøm 2016) and reported all deviations (see Differences between protocol and review). We limited publication bias by conducting an extensive literature search that included databases of both indexed and non-indexed trial records, and sources of unpublished literature. Two individual review authors screened trials for inclusion in order to reduce the risk of missing an eligible trial, and two independent review authors extracted all trial data and evaluated risk of bias domains to validate data and enhance the external validity of this review.

We exclusively included randomised trials to ensure scientific rigour, because observational studies cannot reliably evaluate intervention effects (Savović 2012) and non-randomised trials are prone to selection bias and confounding (Higgins 2011a). We conducted a comprehensive search of the literature and included trials regardless of publication type, publication status, choice of outcomes, and language. We were aware that earlier reviews had problems in identifying trials on short-stay units due to terminology issues, and conducted a broad search that revealed far more trials than previous systematic reviews, which could not be explained by inclusion of new publications. Additionally, we searched the grey literature, and bibliographies of all included trials and earlier systematic reviews to identify missing trials.

We contacted all authors of the included trials to receive additional information and the response rate was high. We evaluated the risk of systematic error by thorough preplanned bias assessments. We explored the reasons behind substantial statistical heterogeneity, tested the robustness of our results with sensitivity analyses (best-worst case scenarios, etc.), and used subgroup analyses to assess the potential impact of bias on the results (Sterne 2011b; Jakobsen 2014).

Limitations

This review also had limitations. The included trials had several important methodological issues that warrant careful interpretation of the analyses. We classified all trials as high risk of bias; that is, the included trials might have been influenced by systematic errors. Trials with high risk of bias tend to overestimate benefits and underestimate harms (Savović 2012). The sample sizes of most trials were relatively small with four trials randomising more than 166 participants (Farkouh 1998; McDermott 1997; Strøm 2017a; Than 2014).

Despite the body of evidence for each outcome being based on randomised trial designs, our GRADE assessments showed that the certainty of the evidence must be regarded as very low. We exclusively identified trials investigating emergency department-based short-stay units; findings may not apply to other short-stay unit settings such as Acute Medical Wards. The trials' participant selection criteria and interventions were dictated by specific conditions and varied among the trials; clinical heterogeneity was present and may threaten the external validity of the findings. We described staffing details in Characteristics of included studies if available, but only two trials reported this (Chivite 2008; Strøm 2017a). The effect of short-stay unit hospitalisation may be confounded by concurrent provision of standardised observation or treatment protocols. We were not able to assess the risk of publication bias due to limited available data.

The lack of proper assessments of serious adverse events in individual trials translates into a flaw in this review. None of the trials reported serious adverse events according to the ICH-GCP guidelines (ICH-GCP 1997). Instead of reporting serious adverse events as proposed in our protocol (Strøm 2016), we used trial authors' definitions of events that we believed were important surrogate markers for serious adverse events. Such surrogate outcome is obviously at risk of reporting components with different degrees of severity.

We assessed outcomes at two time points; time point closest to 90 days to assess short-term effects, and at maximum follow-up to assess both short-term and long-term effects, but very few trials conducted a long-term follow-up.

We did not include an evaluation of emergency department service utilisation, or use of home care after hospitalisation, which could have enhanced the description of downstream effects of the intervention. However, we did not encounter such information in any of the included trials.

Three of the review authors (CS, LSR, TS) are involved in one of the included trials (Strøm 2017a), hence they may be subject to having a potential academic bias. However, we ensured that judgements regarding the given trial did not involve these review authors.

Finally, we did not use Trial Sequential Analysis or any other sequential analysis to assess the risk of random errors (Jakobsen 2014). Hence, we are unaware of the role of 'play of chance' in this present review.

Agreements and disagreements with other studies or reviews

Only a few systematic reviews have investigated effects of short-stay unit hospitalisation. In 2003, Daly and colleagues concluded

that short-stay units had the potential to improve emergency department effectiveness, reduce length of hospital stays, and reduce costs (Daly 2003). A recent review specifically addressing effectiveness of acute medical units (i.e. short-stay units based in internal medicine departments) found a trend towards lower mortality and reduced average length of stay in hospital in participants treated in a short-stay unit-setup (Reid 2016). However, only observational studies were available and authors did not assess the certainty of evidence. Another recent review assessed the effectiveness and safety of emergency department-based short-stay units in comparison with usual care including both bias assessments and grading of the certainty of evidence (Galipeau 2015). They included five trials (Decker 2008; McDermott 1997; Miller 2010; Miller 2013; Roberts 1997), all of which were included in this present review. Authors emphasised that the terminology used to name short-stay units was variable and possessed a major challenge in identifying trials and completing the review. We identified a much larger number of trials, all of them emergency department-based and primarily multipurpose units. Compared with their bias assessment, we judged the risk of bias of the trials to be more profound (Galipeau 2015).

In large epidemiological studies of general internal medicine patients, mortality has been estimated to be around 10% within the first 48 hours (Marco 2010). In contrast, we observed that the mortality was very low across the included trials, indicating that the studied participants were at low risk of dying a priori. Such a low event rate necessitates a very large sample size to ascertain that short-stay unit hospitalisation is non-inferior to usual care. We found the highest mortality in trials including older participants, but advanced age did not seem to be associated with either increased or decreased effect of short-stay unit hospitalisation. Our mortality rates underline that the trial participants are a highly selected group, and it is uncertain to what extent short-stay unit hospitalisation is applicable to a general internal medicine population. How patients should be selected is still an area that should be explored. It is not known whether strict or pragmatic inclusion criteria is to be preferred. We explored whether multi-purpose units compared with specialised units and protocol-based care compared with non-protocol-based care could have had an effect on our results in the meta-analysis. We did not find any evidence of such an effect, but data were sparse and the evidence of very low certainty, and this area should be investigated further in future trials. It is important to acknowledge that this short-stay unit feature should not be over-simplified, because local needs and settings may differ widely and such factors should be taken into account when organising short-stay unit care.

Trials and observational studies comparing the total number of participants treated in a short-stay unit compared with usual care indicate that short-stay unit hospitalisation is associated with significantly shorter hospital stays (Arendts 2006; Chivite 2008; Decker 2008; Farkouh 1998; Gomez 1996; Miller 2010; Miller 2013; Roberts 1997; Ross 2007; Salazar 2006; Strøm 2017a; Sun 2014). However, a comparison with other care models should be interpreted with caution, because short length of stay in hospital is an implicit part of the intervention. It may be reasonable to regard length of stay in hospital as a key performance indicator rather than an outcome.

The short-stay unit model seemed to have cost-sparing effects, but application of individual trial findings to other settings is limited due to the extensive differences in short-stay unit setup, finance, billing, and reimbursement between departments, hospitals, and countries. Eight out of nine trials assessing costs were conducted in the USA. US hospitals may have an interest in establishing short-stay units for economic reasons. A significant number of admissions to inpatient services are deemed improper by the Federal Medicare programme (Feng 2012). In such cases, hospitals have to refund the received Medicare payments. However, a loophole may be found in short-stay units. Physicians or hospitals may substitute an in-hospital admission with placement in a short-stay unit under so-called observation status for economic reasons (Feng 2012). We did not find any indication that such an economic incentive was present in the included trials; but hypothetically, the economic aspect could bias recommendations behind short-stay unit implementation.

AUTHORS' CONCLUSIONS

Implications for practice

In view of the quality of the evidence available, we are not able to determine the effects and compose evidence-based recommendations for or against short-stay unit hospitalisation in for adults with internal medicine diseases and conditions.

All trials were designed to measure the effect of emergency department-based short-stay unit hospitalisation in selected groups of patients. The rates of mortality and serious adverse events observed in the included trials were low, and it is uncertain to what extent short-stay unit hospitalisation affects these outcomes. It is also uncertain whether short-stay unit hospitalisation affects hospital readmissions. There was insufficient evidence to confirm or refute that short-stay unit hospitalisation had important effects on quality of life, activities of daily living, non-serious adverse events, transfer to another department, length of stay in hospital, and costs. The individual trials pointed in the direction of time- and cost-sparing effects and higher quality-of-life scores related to short-stay unit hospitalisation. However, these findings are not validated and warrant validation in larger and scientifically well-conducted trials. All of the trials were at high risk of bias, which is known to be associated with an inherent risk of overestimation of benefits and underestimation of harms.

Implications for research

Large and well-conducted randomised trials are needed that both assess beneficial and harmful effects of short-stay units. Previous trials have primarily estimated outcomes for a narrow subset of participants; there is a need to explore the general effectiveness of short-stay units. To enhance capture of available data, we encourage authors of future papers to use the term 'short-stay unit' to describe units that provide short-term or accelerated care for selected participants in hospital units with a target time frame of a maximum stay in the unit of five days. Furthermore, we encourage authors to report the specific target time frame, describe resources in detail (such as available equipment, staffing, including differences between intervention and comparison resources), and include evaluation of both patient-centred outcomes and health care utility, including cost-analysis.

To date, trials have solely been conducted in emergency department-based settings. The benefits and drawbacks may be different in other settings and should be investigated.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Chivite 2008

Methods	Parallel randomised trial Aim of trial: to compare SSU hospitalisation with hospitalisation in an internal medicine service in older participants with decompensated heart failure Setting: single-centre trial at an urban, tertiary, public university hospital, Barcelona, Spain, November 2001-March 2004 Number of nurses/bed: 4/24 beds in intervention group vs 6/48 beds in usual-care group Number of physicians/bed: 1/24 beds in intervention group vs 5 staff physicians + 5 residents/unclear number of participants in usual-care group Type of SSU: multipurpose unit
Participants	Inclusion criteria: age > 65 years, acute decompensated heart failure, clinical stability, moderate co-morbidity, moderate disability Exclusion criteria: secondary heart failure diagnosis (defined to be ACSs, severe valve disease, pericardial disease, or isolated cor pulmonale), estimated survival < 6 months, severe cognitive impairment, severe functional impairment, unstable clinical condition after initial ED management (defined to be hypotension, tachycardia, electrolyte imbalances, acute kidney failure, need for vasoactive drugs) Sample size was not calculated, consecutive participants were included until the end of the funding

Chivite 2008 *(Continued)*

	Numbers recruited: 139; SSU: 70; internal medicine services: 69 Participants analysed: various numbers of participants lost to follow-up depending on outcome and time of assessment Mean age: 77 (SD 6.3) in intervention group vs 78.9 (SD 6.6) in usual-care group Male: 35 (54%) in intervention group vs 35 (51%) in usual-care group NYHA: 2.6 (SD 0.6) in intervention group vs 2.5 (SD 0.5) in usual-care group CCI: 2.5 (SD 1.3) in intervention group vs 2.2 (SD 1.2) in usual-care group
Interventions	Intervention: treatment in SSU, no standardised treatment protocol, but aimed at early removal of iv lines and early discharge planning, urinary catheters and bed rest was discouraged Usual care: hospitalisation in internal medicine services, no further description available
Outcomes	Outcome hierarchy was not available in the methods section, but trial authors stated that they investigated 3 primary outcomes: Primary outcomes: 1-year heart failure-related hospital readmission, 1-year heart failure-related ED revisit, and 1-year all-cause mortality. Secondary outcomes: index admission length of stay in hospital, QoL (change in Minnesota Living With Heart Failure Quality of Life Scale and European Heart Failure Self-Care Behaviour Scale), functional status (Barthel Index and OARS-IADL), exercise capacity (NYHA, 6 minutes walking test), and total hospital costs
Notes	Defined time limit of maximum stay in the SSU: 5 days, but transfers were not compulsory after deadline Follow-up: 1 year Trial registration: no registration Study was only available in abstract format, details on trials including bias assessment were obtained after contact with trial authors. Received additional information from trial authors by 6 March 2017

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computerised random number generation (information following contact with the trial authors)
Allocation concealment (selection bias)	Low risk	Opaque sealed envelopes (information following contact with the trial authors)
Baseline outcome measurement	Unclear risk	No baseline measure of outcomes QoL and activities of daily living obtained from trial authors
Baseline characteristics	Low risk	No differences between groups (detailed information from the trial authors)
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding (information following contact with the trial authors)
Incomplete outcome data (attrition bias)	High risk	Sample size was not calculated, consecutive participants were included until the end of the funding. Various numbers of participants lost to follow-up de-

Chivite 2008 *(Continued)*

All outcomes		pending on outcome. < 15% of included participants were lost to follow-up for mortality and hospital readmission, but > 15% of included participants were lost to follow-up for quality-of-life measurements. Unclear how many participants were analysed for costs. No participants were lost to follow-up for length of stay in hospital (information following contact with trial authors).
Contamination	Unclear risk	Unclear if there was risk of contamination
Selective reporting (reporting bias)	High risk	The trial was not registered a in a trial register, trial was conducted before 2005 (2001-2004). No protocol was available. All outcomes noted in abstract were reported in detail after contact with trial authors.
Other bias	High risk	Sample size was not calculated, consecutive participants were included until the end of the funding. Dr. Salazar had written more than 3 papers on SSUs, academic bias may be present. The trial was solely reported in an abstract, not published.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Decker 2008

Methods	Parallel randomised trial Aim of trial: to compare outcomes in care of participants with acute onset AF randomised to observation unit with electrical cardioversion or routine inpatient admission Setting: single-centre trial conducted in an urban, tertiary, private non-profit hospital, Rochester, Minnesota, USA, September 1999-December 2002 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit
Participants	Participants with AF Inclusion criteria: adult participants > 18 years presenting to ED with AF of < 48 h duration, without haemodynamic instability, or other conditions requiring hospitalisation Exclusion criteria: AF of > 48 h duration, uncertain duration of symptoms, haemodynamic instability (systolic BP < 90 mmHg, diastolic BP < 50 mmHg, pulse rate of ≥ 130 bpm after attempts to rate control, known intracardiac thrombus, class IV congestive heart failure, ejection fraction < 30%, chest pain consistent with class IV angina, acute MI within 4 weeks before AF onset, stroke or transient neurologic ischaemic attack in the past 3 months, previous unsuccessful electrical cardioversion of AF or active medical problems other than AF such as unstable angina, pneumonia, transient neurologic ischaemic attacks, and strokes requiring inpatient evaluation, patients residing outside of Olmsted County or its surrounding 9 counties Numbers recruited: 153, 75 to the intervention group vs 78 to the usual-care group Participants analysed for the primary outcome: 153 Mean age: 58 (SD 18) in intervention group vs 59 (SD 16) in usual-care group Male: 40 (53%) in intervention group vs 54 (69%) in usual-care group
Interventions	Intervention: 8-h ED observation unit protocol including recording of an ECG, chest radiograph, and routine laboratory investigations followed by pharmacologic pulse rate control and continuous car-

Decker 2008 *(Continued)*

	diac monitoring for 6 h. Those still in AF were sedated and electrically cardioverted and observed for a further period of 2 h. Those in sinus rhythm after the 2-h observation period were discharged home, with cardiology follow-up arranged within 3 days. Those remaining in AF after unsuccessful attempts to electrically cardiovert were admitted to the hospital cardiology service Usual care: routine hospital care with an ECG and routine laboratory investigations in the ED, administration of an iv calcium channel blocker or a blocker for rate control, initiation of heparin infusion, and admission to a monitored bed on the cardiology service Intervention in details: 8-h ED observation unit protocol included recording of an ECG, chest radiograph, and routine laboratory investigations, including electrolyte levels, CBC, and glucose level. This was followed by pharmacologic pulse rate control using a calcium channel blocker or alpha-blocker. Rate control was defined as a ventricular response < 100 bpm at rest. All participants received continuous cardiac monitoring and were reassessed after 6 h. Those still in AF were sedated and electrically cardioverted with the Physio Lifepak 6 (Medtronic Inc., Minneapolis, MN; before 2001) or the Zoll M Series Biphasic Manual device (Zoll Medical Corporation, Burlington, MA; after 2001) for correction of AF and observed for a further period of 2 h. Those in sinus rhythm after the 2-h observation period were discharged home, with cardiology follow-up arranged within 3 days. Participants who were enrolled in the trial in the evening were observed overnight and cardioverted between 7 and 9 am Study participants treated in the ED observation unit were not given any antiarrhythmic on discharge and were not anticoagulated. Those remaining in AF after unsuccessful attempts to electrically cardiovert were admitted to the hospital cardiology service. All care, including initial evaluation, ED observation unit care, procedural sedation, and cardioversion, was overseen by the emergency medicine attending physician on duty
Outcomes	Primary outcome: conversion to sinus rhythm or rate control at the completion of initial ED observation unit or hospital stay Secondary outcomes: recurrence of AF and adverse events (subsequent MI, congestive heart failure, stroke, or death). Further utilisation of healthcare resources was measured by further recurrent visits to the hospital
Notes	Defined time limit of maximum stay in the SSU: 8 h Follow-up: 6 months Trial registration: none Received additional information from trial authors by 27 February 2017

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random sequence generation provided by a remote, designated randomisation centre not involved in participant care
Allocation concealment (selection bias)	Low risk	Allocation concealment provided by a remote, designated randomisation centre not involved in participant care
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Unclear risk	Higher proportion of female participants in intervention group (47% vs 31%), may or may not have affected outcomes
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Assessment method was by medical record review, and if necessary telephone calls. Trial authors informed that outcome assessors were blinded for treatment allocation, but it seems unlikely that the medical record review would not reveal the unit of allocation

Decker 2008 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Clearly described that no participants were lost to follow-up, and no withdrawals
Contamination	High risk	Participants in intervention group were transferred to inpatient care if needed
Selective reporting (reporting bias)	High risk	No trial registration. No protocol was described. Trial authors described all outcomes in outcome section as defined in the methods section
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Farkouh 1998

Methods	Parallel randomised trial Aim of trial: to compare the safety, efficacy, and use of resources of a CPU with those of routine hospital admission for participants with unstable angina who were at intermediate risk for cardiovascular events in the long term Setting: single-centre trial at an urban, tertiary, public hospital, Rochester, Minnesota, USA, November 1995-March 1997 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: specialised unit
Participants	People with chest pain that met the criteria for unstable angina and intermediate risk for cardiovascular events. Inclusion criteria: age ≥ 18 years, unstable angina, and intermediate risk for cardiovascular events (defined by presence of angina at rest for at least 20 min or unresponsive to nitroglycerin, dynamic ECG T-wave inversions with angina, nocturnal angina, or new onset of Canadian Cardiovascular Society classification III or IV angina 2 weeks before presentation) Exclusion criteria: participants were excluded if they had ST-segment elevation on the ECG, an obvious noncardiac cause of the chest pain, unstable angina associated with a low or high risk, or a coexisting condition requiring hospitalisation. Numbers recruited: 424, 212 to the intervention group vs 212 to the usual-care group Participants analysed for the primary outcome: For the long-term follow-up, 407 participants were analysed (trial authors excluded 17 participants due to lack of consent to obtain surveillance data, 8 in the intervention group, and 9 in the usual-care group) Mean age: 57.7 (SD 1) in intervention group vs 59.2 (SD 1) in usual-care group Male: 56.1% in intervention group vs 55.7% in usual-care group
Interventions	Intervention: the CPU consisted of 4 beds in a separate area of the ED. It was equipped with event monitors and continuous ST-segment monitoring and was staffed by a full-time nurse. Care in the CPU was standardised due to a pre-defined protocol (scheduled measurement of CK-MB levels, observation for

Farkouh 1998 *(Continued)*

	minimum 6 h, 325 mg of aspirin, cardiac function study (treadmill testing or nuclear stress studies, follow-up appointment at 72 h after discharge by staff-cardiologist)) Usual care: non-standardised treatment in a monitored bed under the care of the cardiology service. This service consisted of a team of internal medicine residents or cardiology fellows under the supervision of a staff cardiologist. Intervention detail: the total level of creatine kinase MB isoenzyme (CK-MB) was measured at the time points 0, 2, and 4 h after randomisation. If the CK-MB level was elevated at any time, participants were admitted to the cardiology service or to the coronary care unit with a presumptive diagnosis of MI. Participants were also admitted from the CPU to the hospital if they had symptoms of recurrent chest pain consistent with recurrent unstable angina or important ventricular dysrhythmia or had another medical condition warranting admission. All the participants randomly assigned to the CPU were observed for a minimum of 6 h, and all received 325 mg of aspirin. The decision whether to administer iv heparin was made by the ED physician according to clinical criteria. For all participants who 'passed' (completed) the observation period in the CPU, a cardiac-function study was performed at the end of the observation period. A treadmill exercise test was performed if the participant was judged to be able to walk on a treadmill at a rate of at least 2.5 mph and if there was no ECG evidence of left ventricular hypertrophy, ventricular-paced rhythm, left bundle-branch block, or the Wolff–Parkinson–White syndrome. Otherwise a nuclear stress test or echocardiographic stress test was performed. Treadmill and nuclear stress studies were routinely available between 7 am and 10:30 pm, on both weekdays and weekends. All the results of the cardiac function studies were interpreted by staff cardiologists. The Duke treadmill scoring system was used to score the performance on the treadmill exercise test; a score of ≥ 5 was considered negative. The results of imaging studies were classified as negative, equivocal, or positive. All the participants with negative results on a treadmill or imaging study were discharged to their homes. Participants with a treadmill score of ≤ 5 or positive results on an imaging study were admitted to the hospital. All those who were discharged from the CPU returned to the outpatient clinic within 72 h for a follow-up evaluation with a staff cardiologist
Outcomes	Primary outcome: occurrence of nonfatal MI, death, acute congestive heart failure, stroke, or out-of-hospital cardiac arrest (composite outcome) Secondary outcomes: additional visits to the ED for chest pain or the use of any of the following tests and procedures: cardiac revascularisation, cardiac diagnostic tests and any hospitalisation for cardiac care during the 6 months after randomisation, and use of resources
Notes	Defined time limit of maximum stay in the SSU: not clearly defined Duration of participation: 6 months The long-term follow-up study can be found in Cullen 2011. We contacted trial authors to obtain further details of the trial, but no reply was received Trial registration: NA

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were stratified according to sex, previous MIs, previous revascularisation procedure, but random sequence generation not described
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not described
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Baseline characteristics were described and similar in the intervention and control group

Farkouh 1998 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding of outcome assessment was not described
Incomplete outcome data (attrition bias) All outcomes	Low risk	Authors excluded 17 participants due to lack of consent to obtain surveillance data (8 in the intervention group and 9 in the usual-care group) in the long-term follow-up; clearly described and still < 15% of included participants
Contamination	High risk	115/212 participants in the intervention group were transferred to the cardiology service (usual care)
Selective reporting (reporting bias)	High risk	The trial was not registered a in trial register. No protocol was described. All outcomes defined in the methods section were reported
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Gomez 1996

Methods	Parallel randomised trial Aim of trial: to compare the safety and cost-effectiveness of a Rapid Rule-Out of Myocardial Ischemia Observation (ROMIO)-protocol in an ED-based Chest Pain Evaluation Unit for ruling out ischaemia with a routine hospital care strategy Setting: single-centre trial conducted in an urban, tertiary, non-profit, public university hospital, Salt Lake City, Utah, USA, no information on trial dates, trial was conducted over a period of 19 months Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: specialised unit, part of a multipurpose ED
Participants	Chest pain participants with low probability of MI Inclusion criteria: age > 30 years, chest pain-correlated symptoms that could not be explained by local trauma or abnormalities on a chest X-ray film and was considered by the ED physician to be sufficiently suggestive of myocardial ischaemia to require hospital admission to rule out infarction or unstable angina, presentation suggesting a low (< 7%) predicted probability of infarction, and absence of acute ischaemic changes on baseline ECG Exclusion criteria: ECG evidence of acute ischaemia, sustained ventricular tachycardia or non-sustained ventricular tachycardia, frequent ventricular ectopic activity or supraventricular tachycardia requiring iv medications, 2nd- or 3rd-degree heart block or new bundle branch block, need for iv nitroglycerin, systolic BP > 220 mm Hg or diastolic pressure > 120 mm Hg despite therapy, congestive heart failure requiring iv medications or intensive monitoring, other conditions requiring iv medications or intensive nursing care Numbers recruited: 100, 50 to the intervention group vs 50 to the usual-care group Participants analysed for the primary outcome: 100 Mean age: 50 (SD not provided) in intervention group vs 53 (SD not provided) in usual-care group Male: 31 (62%) in intervention group vs 30 (60%) in usual-care group

Gomez 1996 *(Continued)*

Interventions	Intervention: placement in chest pain evaluation unit and rapid rule-out protocol defined by iv access, administration of 325 mg oral aspirin, oxygen therapy if needed, serial creatine kinase and MB isoenzyme levels at 0, 3, 6 and 9 h, continuous ST-segment monitoring was performed. If no signs of ischaemia was found, participants underwent symptom-limited graded exercise test. If sign of ischaemia was found, participants were transferred to a coronary care unit. Usual care: routine care was admission to hospital, participants were managed by their attending physicians, who made all further triage, diagnostic and therapeutic decisions, including choice of assigned unit (coronary care unit, telemetry bed, general floor), laboratory testing, drug therapy, diagnostic testing and procedures, length of hospital stay, and timing of hospital discharge Participants in both groups, who were unable to perform or complete an exercise test or whose test result was equivocal or not interpretable, underwent dobutamine stress echocardiography. Participants who had negative results on a treadmill test or dobutamine stress echocardiogram were discharged home. Intervention in detail: participants were placed in the chest pain evaluation unit, where prewritten orders detailing the rapid rule-out protocol were followed, iv access was obtained (saline solution-filled catheter), and 325 mg of oral aspirin was administered. Oxygen was given only for dyspnoea or for an oxygen saturation lower than 90% as assessed by pulse oximetry. Serial creatine kinase and MB isoenzyme levels were obtained at 0.3, 6 and 9 h. Continuous ST-segment monitoring was performed. Participants who did not have ischaemic changes (with or without chest pain) on serial ECGs and had negative serial cardiac enzyme values negative for infarction underwent a symptom-limited graded exercise test. Testing was to be performed in a timely manner (generally 9-12 h after admission and between 7:00 am and 1:00 am). Participants were transferred from the chest pain evaluation unit to a monitored bed or the coronary care unit if they had 1) ECG changes consistent with acute ischaemia; 2) positive findings on creatine kinase MB determinations, rest echocardiogram, graded exercise or dobutamine stress echocardiographic tests; or 3) any other condition requiring hospital admission for further evaluation and treatment.
Outcomes	Primary outcome: length of stay in hospital, charges for initial stay, charges for 30 days of follow-up Secondary outcomes: missed diagnosis of MI, postrandomisation hospital charges by category, frequency of making a final diagnosis of acute MI or unstable angina (overall and by trial group)
Notes	Defined time limit of maximum stay in the SSU: no time limit clearly described Follow-up was performed at 30 days Trial registration: no registration None of the usual-care group participants were initially assigned to a bed in a coronary care unit bed, in contrast to the traditional approach at the time Received additional information from trial authors by 2 March 2017 Information on re-visits for chest pain which led to in-hospital stress tests was available, but not clear whether authors recorded hospital readmissions for participants.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Random sequence generation not described
Allocation concealment (selection bias)	Low risk	Allocation concealment by sealed envelopes
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant

Gomez 1996 *(Continued)*

Baseline characteristics	Low risk	Baseline characteristics were described and similar in the intervention group and usual-care group
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Unclear risk, not described in trial publication. Trial authors told us that those documenting length of stay in hospital and hospital charges were not involved in the protocol, but blinding was not clearly described. Other outcomes were assessed non-blinded (we did not assess these outcomes in the current review)
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants were followed up and analysed
Contamination	High risk	Participants randomised to the chest pain evaluation unit were admitted to the in-hospital service if they had a positive test during their stay
Selective reporting (reporting bias)	High risk	The trial was not registered a in a trial register and no protocol was described, trial was conducted before establishment of trial registers. All outcomes that were described in the methods section were reported upon in the results section
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

McDermott 1997

Methods	Parallel randomised trial Aim of trial: to evaluate the medical and cost-effectiveness, participant satisfaction, and QoL of participants receiving Emergency and Diagnostic Treatment Unit care for acute asthma compared with inpatient care Setting: multicentre trial conducted in two urban, tertiary, public hospitals, Chicago, Illinois, USA, December 1992-April 1995 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit
Participants	Participants with acute moderate-severe asthma exacerbation Inclusion criteria: history of asthma, age 18-55 years, an acute exacerbation of asthma, and failure to meet discharge criteria after 3 h of ED therapy Exclusion criteria: PaCO2 of ≥ 45 mm Hg or PaO2 of ≥ 55 mm Hg, peak expiratory flow rate of ≤ 80 L/min after the first adrenergic treatment, asthma onset after age 45 years and a ≥ 10 pack-per-year history of smoking, a reported best peak flow less than the discharge criteria, pregnancy, or a diagnosis of pneumonia, congestive heart failure, or restrictive lung disease prior to eligibility assessment Numbers recruited: 222, 110 to the intervention group vs 112 to the usual-care group Participants analysed for the primary outcome: 222 Mean age: 36 (SD 11) in intervention group vs 35 (SD 10) in usual-care group

McDermott 1997 *(Continued)*

	Male: 64 (58)% in intervention group vs 70 (64)% in usual-care group
Interventions	Intervention: standardised treatment protocol in Emergency and Diagnostic Treatment Unit with scheduled administration of nebuliser at h: 4, 6, 8, 10, and 12 and a repeated steroid dose at hour: 6. If predefined criteria were met (see below), participants were discharged. Discharge criteria were assessed repeatedly. If discharge criteria were not met within 12 h, participants were admitted to in-hospital service Usual care: treatment in a hospital ward according to national asthma guidelines i.e. handheld nebuliser every second hour for 3 treatments after admission and 4 times thereafter, and 60 mg of methylprednisolone on arrival and every 6 h thereafter. Discharge criteria were similar to the intervention group, but participants were only assessed at time of arrival at ward and then on daily rounds Discharge criteria for both groups: high-risk participants required a peak expiratory flow rate of 60% of the predicted value, while participants not at high risk needed a peak expiratory flow rate of 50%. Participants were at high risk if the index ED visit was for a short-term relapse (second visit within 10 days) or if the participant could recall any of the following: previous intensive care unit admission or intubation, hospitalisation for asthma within the previous year, ≥3 ED visits for asthma in the previous 6 months, or use of oral steroids for more than half of the previous year
Outcomes	No definition of outcome hierarchy Outcomes: relapse rates, discharge rate, length of stay in hospital, minor morbidity (cough, wheezing, dyspnoea, nocturnal awakenings), moderate morbidity (major lifestyle-limitating events e.g. days missed from work or school, days incapacitated during waking hours), major morbidity (unscheduled visits for treatment of acute asthma i.e. relapse), direct medical costs, participant satisfaction, and QoL
Notes	Defined time limit of maximum stay in the SSU: 12 h Follow-up: week 1, 3, 5, 7, 8 after initial attendance Additional reports of the trial is found in Rydman 1998 and Rydman 1999 Trial registration: NA We contacted trial authors twice but no reply received

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Method of random sequence generation not described
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not described
Baseline outcome measurement	Low risk	No difference in QoL measured at baseline
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Follow-up visits were performed by personnel blinded to the allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Dropout and withdrawals insufficiently described e.g. trial authors stated that 65/110 in the intervention group and 67/112 participants in the usual-care group showed up at 1 week follow-up, but they only report QoL outcomes for

McDermott 1997 *(Continued)*

		57 intervention-participants and 56 usual care-participants; for participant satisfaction, reason for dropouts were not described
Contamination	Unclear risk	Not described
Selective reporting (reporting bias)	High risk	No trial registration. No protocol was described. All outcomes described in the methods section were reported
Other bias	Unclear risk	Authors (Rydman, McDermott, Roberts, Zalenski, Murphy, McCarren, Kampe) had written more than 3 papers on SSUs, academic bias may be present. The trial appeared to be free of other components that could put it at risk of bias
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Miller 2010

Methods	Parallel randomised trial Aim of trial: to determine whether imaging with cardiac MRI in an observation unit would reduce medical costs among participants with emergent non-low-risk chest pain who otherwise would be managed with an inpatient care strategy Setting: single-centre trial conducted in an urban, tertiary, public hospital, Winston-Salem, North Carolina, USA, January 2008-March 2009 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit (information provided by trial authors)
Participants	Chest pain with intermediate or high probability of ACS Inclusion criteria: aged ≥ 18 years, symptoms of possible ACS, care provider impression that inpatient evaluation was required, ability to be discharged if cardiac disease was excluded, and intermediate or high probability for experiencing ACS defined by either the ED care provider's clinical impression or a Thrombolysis in Myocardial Infarction risk score ≥ 2 Exclusion criteria: initial increased troponin I level, new ST-segment elevation (≥ 1 mV) or depression (≥ 2 mV), inability to lie flat, systolic BP < 90 mm Hg, contraindications to MRI, refusal of follow-up procedures, terminal diagnosis with < 3 months to live, pregnancy, renal insufficiency, chronic liver disease, or a history of heart, liver, or kidney transplant Numbers recruited: 110, 53 to the intervention group vs 57 to the usual-care group Participants analysed for the primary outcome: 110 Median age (IQR): 55 (48-61) in intervention group vs 57 (47-64) in usual-care group Male: 25 (47%)% in intervention group vs 30 (53%) in usual-care group
Interventions	Intervention: standardised protocol in ED observation unit, the unit was staffed by nurse practitioners or physician assistants and supervised by a board-certified emergency physician. Protocol included cardiac biomarkers at 4 and 8 h, and stress cardiac MRI examination available weekdays 8 am-5 pm If the 4-h troponin I level was < 1.0 ng/mL, participants could receive the stress cardiac MRI examination at the first available period. Usual care: inpatient care i.e. evaluation by a consulting physician in the ED for the intent of admission, following usual procedures. Participants with established cardiology care or higher-risk profiles

Miller 2010 *(Continued)*

	were generally admitted to the cardiology service. Others were admitted to hospital-based services and cared for by internists or family medicine physicians. Care patterns in this group were determined by the care providers unaffected by the trial protocol. Cardiac MRI was available to these participants.
Outcomes	Primary outcome: direct medical cost of the index hospital visit Secondary outcome: in-trial registration reported to be correct admission decision (according to ACS diagnosis within 30 days), number of participants randomised to intervention that were able to complete cardiac MRI, utilisation of healthcare procedures, adverse events during MRI, adverse events leading to early termination of MRI
Notes	Defined time limit of maximum stay in the SSU: 24 h but not hard cut-off (information provided by trial authors) Follow-up: 30 days Long-term outcomes are reported in a secondary publication (Miller 2011) Trial registration: nCT00678639 Received additional information from trial authors by 28 February 2017

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers. Stratified block randomisation scheme, stratification according to presence of coronary artery disease and time of presentation (day or evening/night) (additional information provided by trial authors, did not change bias evaluation)
Allocation concealment (selection bias)	Low risk	Opaque, sealed envelopes
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	High risk	More participants in usual-care group had previous cardiovascular events
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding (information provided by trial authors)
Incomplete outcome data (attrition bias) All outcomes	Low risk	Dropouts clearly described and below 15% of recruited participants (2 in intervention group, 0 in usual-care group)
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	Low risk	All outcomes stated in trial registration reported
Other bias	High risk	Trial authors (Miller, Hwang, Case, Hoekestra, Harper, Lefebvre)) had written more than 3 papers on SSUs, academic bias may be present. Dr. Miller had received support from Siemens, the MRI scanner used was a Siemens model.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Miller 2013

Methods	Parallel randomised trial Aim of trial: to determine whether imaging with cardiac MRI in an observation unit would reduce medical costs among participants with emergent non-low risk chest pain who otherwise would be managed with an inpatient care strategy Setting: single-centre trial conducted in an urban, tertiary, public hospital, Winston-Salem, North Carolina, USA, January 2010-October 2011 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit (information provided by trial authors)
Participants	Participants with chest pain and intermediate or high probability of ACS Inclusion criteria: ≥ 21 years old presenting with symptoms suggestive of ACS, intermediate risk chest pain defined as either a Thrombolysis in Myocardial Infarction risk score of ≥ 2 or a physician global risk assessment based on the ACC/AHA guidelines of intermediate or high risk. At time of enrolment, the ED attending had to declare the participant as being safe for observation unit care, and that the participant could be discharged home if cardiac disease was excluded as the cause of symptoms Exclusion criteria: definite ACS at the time of enrolment, known inducible ischaemia, hypotension, contraindications to cardiac MRI, life expectancy < 3 months, pregnancy, coronary revascularisation within 6 months, and increased risk for nephrogenic systemic fibrosis, clinical concern for acute kidney injury, hepatorenal syndrome, or solid organ transplant Numbers recruited: 105, 52 to the intervention group vs 53 to the usual-care group Participants analysed for the primary outcome: 105 Median age (IQR): 54 (35-91) in intervention group vs 59 (40-76) in usual-care group Male: 28 (54%) in intervention group vs 29 (55)% in usual-care group
Interventions	Intervention: standardised protocol in ED observation unit, the unit was staffed by nurse practitioners or physician assistants and supervised by a board-certified emergency physician. Protocol included cardiac biomarkers at 4 h and 8 h, and vasodilator cardiac MRI examination available weekdays 8 am-5 pm If the 4-h troponin I level was < 1.0 ng/mL, participants could receive the stress cardiac MRI examination at the first available period. Interpretations, the need for cardiology consultation, and decisions to perform revascularisation were not directed by the trial protocol. The intervention protocol differed from Miller 2010 in the cardiac MRI sequences in the intervention arm. Usual care: usual-care participants underwent consultation in the ED by the admitting service in accordance with customary practice (Cardiology, Internal Medicine, and Family medicine services) and could be admitted to any service. Care delivery was not dictated by a trial protocol.
Outcomes	Primary outcome: coronary revascularisation, all-cause hospital readmission, or recurrent cardiac testing within 90 days of randomisation (composite outcome) Secondary outcomes: index visit length of stay in hospital, safety events (all-cause mortality within 90 days, adverse events related to index visit stress testing, ACS after discharge and within 90 days of randomisation)
Notes	Defined time limit of maximum stay in the SSU: 24 h but not hard cut-off (information provided by trial authors) Follow-up: 90 days

Miller 2013 *(Continued)*

Trial planned to recruit 146 participants, but the number of events defining the sample size were obtained after enrolment of 105 participants and trial was stopped

Trial registration: NCT01035047

Received additional information from trial authors by 28 February 2017

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers, variable sized permuted blocks, stratified by presence of known coronary disease
Allocation concealment (selection bias)	Low risk	Concealed in computer system
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding (information provided by trial authors)
Incomplete outcome data (attrition bias) All outcomes	High risk	Trial planned to recruit 146 participants, but the number of events defining the sample size were obtained after enrolment of 105 participants and trial was stopped. No dropouts. Participants lost to follow-up were censored at the point of last contact. They were clearly described, the number was below 15% of trial population (6/105)
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	Low risk	All outcomes stated in trial registration reported upon
Other bias	High risk	Dr. Miller had received support from Siemens, the MRI scanner used was a Siemens model.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Roberts 1997

Methods	Parallel randomised trial Aim of trial: the objectives of this trial were to evaluate the hospital admission rate, cost, and length of stay in hospital using an accelerated diagnostic protocol in a chest pain observation unit compared with hospitalised controls Setting: single-centre trial at an urban, tertiary, public hospital, Chicago, Illinois, USA, January 1993-April 1995 Number of nurses/bed: unclear

Roberts 1997 *(Continued)*

	Number of physicians/bed: unclear Type of SSU: specialised unit
Participants	Participants with chest pain and low probability of acute MI Inclusion criteria: age > 20 years, hospitalisation necessary (physician judgement), low probability for acute MI (Goldman algorithm), ability to perform ECG exercise stress test Exclusion criteria: history of prehospital or ED complication of acute ischaemia or MI, new ECG findings consistent with MI or ischaemia, protocol performance put participant at risk, concurrent or alternate noncardiac diagnosis requiring urgent hospitalisation, problem with performance or interpretation of ECG exercise stress test Numbers recruited: 165, 82 to the intervention group vs 83 to the usual-care group Participants analysed for the primary outcome: 165 Mean age: 47.3 (SD 9.9) in intervention group vs 48.0 (SD 11.4) in usual-care group Male: 45 (54.9%) in intervention group vs 44 (53)% in usual-care group
Interventions	Intervention: accelerated diagnostic protocol in a chest pain observation unit consisting of 12-h rhythm monitoring, creatine kinase-MB levels at 0, 4, 8, and 12 h, ECGs at 0, 6, and 12 h, clinical examination and review of test results by an attending physician at 0, 6, and 12 h or for any change in condition, aspirin, 2 L oxygen by nasal cannula, and iv line, nitrates were given if recurrent chest pain. If all the clinical and test findings were negative, participants were taken to the adjacent cardiac laboratory for immediate ECG exercise stress test, if negative, participants were discharged. If positive or uncertain test results at any time, participants were admitted to in-hospital service Usual care: participants were admitted to the telemetry unit on the internal medicine service for standard management at the time (3 sets of cardiac enzyme studies, two ECGs, and 24 h of cardiac and clinical monitoring), management was at the discretion of the internal medicine attending physician
Outcomes	Not outcome hierarchy, but sample size calculation was based on costs. Outcomes: length of stay in hospital, costs, hospital admission rate
Notes	Sample size was estimated to 200 participants, only 166 participants were randomised When participants in the intervention group reached predefined discharge criteria, they were transferred to another ward for additional 24 h of monitoring, because this trial was part of a larger trial investigating diagnostic accuracy Defined time limit of maximum stay in the SSU: 12 h Follow-up: 8 weeks Trial registration: NA We contacted trial authors twice, but no response received

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers
Allocation concealment (selection bias)	Low risk	Opaque enveloped constructed by trial personnel not connected to the ED or enrolment process

Roberts 1997 *(Continued)*

Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Cost and length of stay in hospital were abstracted from research forms, medical records, and hospital information systems. Uncertain whether assessors were blinded to the allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	One withdrew consent in intervention group, thus, the number of exclusions was low (< 15%)
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	High risk	No trial registration. No protocol was described. Trial authors described outcomes as defined in the methods section
Other bias	Unclear risk	Authors (Zalenski) had written more than 3 papers on SSUs, academic bias may be present. The trial appeared to be free of other components that could put it at risk of bias
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Ross 2007

Methods	Parallel randomised trial Aim of trial: to determine whether treatment of transient ischaemic attack participants using an accelerated diagnostic protocol in the ED observation unit was associated with a decrease in the length of stay in hospital, costs, and with comparable diagnostic and 90-day clinical outcomes relative to traditional inpatient care Setting: single-centre trial conducted in a suburban teaching hospital (unclear where), USA, August 2003-June 2005 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit
Participants	Participants presenting with transient ischaemic attack Inclusion criteria: episode of transient ischaemic attack judged by a board-certified emergency physician, without the aid of a neurologist Exclusion criteria: head CT imaging positive for bleeding, mass, or acute infarction, known possible embolic source, persistent acute neurologic deficit, crescendo transient ischaemic attacks, non-focal symptoms, hypertensive encephalopathy, severe headache or evidence of cranial arteritis, fever or other acute medical problems requiring inpatient admission, previous large stroke, severe dementia or nursing home patient, patient unlikely to survive beyond trial follow-up period (90 days), social issues that made ED discharge or follow-up unlikely, history of iv drug use Numbers recruited:149, 75 in intervention group vs 74 in usual-care group

Ross 2007 *(Continued)*

	Participants analysed for the primary outcome: 149 Mean age: 68.4 (SD 15.3) in intervention group vs 67.7 (SD 15.4) in usual-care group Male: 31 (41%) in intervention group vs (53)% in usual-care group
Interventions	Intervention: diagnostic protocol in ED observation unit consisting of carotid imaging (Doppler, magnetic resonance angiography), echocardiography, serial evaluations (serial assessments by nurses, emergency physicians, and physician assistants, and a neurologist consultation), cardiac monitoring for at least 12 h. Participants were admitted to inward service if they had recurrent neurologic symptoms or developed stroke, significant carotid stenosis requiring urgent revascularisation, evidence of a thromboembolic source, requiring inpatient anticoagulation treatment with heparin, unable to complete the evaluation or be safely discharged home in 18-24 h, or if the physician thought that admission was needed. Participants who were discharged from the ED observation unit were instructed to follow up within 1-3 days with their primary care physician or neurologist. Usual care: hospital admission, could be both stroke unit, internal medicine or other. Participants admitted to the inpatient control group had their primary attending physician or hospitalist service attending physician contacted to discuss the participants' admission. From this discussion, the emergency physician completed the enclosed inpatient admission order forms, and the participant was admitted to that attending physician, with most admissions being to the internal medicine service. The hospital had a designated stroke unit; however, a bed in that unit was not routinely available for transient ischaemic attack patients. Alternatively, patients were admitted to an available regular medical floor and wore a portable cardiac-monitoring device. The decision to cancel or modify the initial admitting orders and when to discharge the participant home was made by the admitting attending physician on a case-by-case basis
Outcomes	Primary outcome: index visit length of stay in hospital Secondary outcomes: 90-day total direct cost and clinical outcomes, which included stroke, major clinical events, recidivism, the timeliness of diagnostic testing, the percentage of tests completed, and test outcomes
Notes	Defined time limit of maximum stay in the SSU: 24 h Follow-up: 8 weeks Trial registration: NA We contacted trial authors twice for additional information but no response received

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessors were not blinded for treatment allocation

Ross 2007 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants were followed up
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	High risk	No trial registration. No protocol was described. All outcomes described in the method section were reported in the paper.
Other bias	Unclear risk	The trial appeared to be free of other components that could put it at risk of bias.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Rydman 1997

Methods	Parallel randomised trial Aim of trial: to compare patient satisfaction among chest pain participants randomised to a chest pain observation unit and those who underwent hospital inpatient observation Setting: single-centre trial at an urban, tertiary, public hospital, Chicago, Illinois, USA, trial dates not defined Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: specialised unit
Participants	Chest pain patients with low risk of acute MI Inclusion criteria: participants in need of hospital admission but at low probability (by a validated algorithm according to trial authors) for acute MI Exclusion criteria: known coronary artery disease, cardiac complications, severe comorbidities, or inability to perform exercise testing Numbers recruited: 104, 52 to the intervention group vs 52 to the usual-care group Participants analysed for the primary outcome: 104 Mean age: 47.9 (SD 8.6) in intervention group vs 47.3 (SD 12.0) in usual-care group Male: 61% in intervention group vs 59% in usual-care group
Interventions	Intervention: transfer to bed chest pain observation unit and 12-h chest pain protocol with serial measurements of creatine kinase-MB, ECGs, and clinical assessments followed by ECGs Usual care: in-hospital observation
Outcomes	Primary outcome: patient satisfaction Secondary outcome: correlation of patient characteristics and process of care with overall patient satisfaction
Notes	Defined time limit of maximum stay in the SSU: 12 h

Rydman 1997 *(Continued)*

	Duration of participation: time from randomisation to either hospital discharge for inpatients and the end of diagnostic protocol for intervention group (thus, not same time points for groups) The participants in the intervention group scored higher than those randomised to the inpatient hospitalisation protocol on 4 summary ratings of patient satisfaction measures: quality of the service, recommendation of the service to others, effective treatment of health problem, and overall satisfaction. Trial registration: NA We contacted trial authors twice for additional information but no response received

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Method of random sequence generation not described
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not described
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Assessments were performed by trained researcher, unclear whether they were blinded to the allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants followed up
Contamination	Unclear risk	Not described
Selective reporting (reporting bias)	High risk	No trial registration. No protocol was described. All outcomes described in the methods section were reported.
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Shen 2004

Methods	Parallel randomised trial Aim of trial: to assess whether an area designated for syncope evaluation in the ED observational unit ("syncope unit") could affect diagnostic yield and the rate of hospital admission for syncope participants with intermediate-risk profiles for a poor prognosis Setting: single-centre trial at a tertiary, private, not-for profit hospital, Rochester, Minnesota, USA, January 2000-April 2004 Number of nurses/bed: unclear

Shen 2004 *(Continued)*

	Number of physicians/bed: unclear Type of SSU: specialised unit
Participants	Participants with syncope and an intermediate risk for an adverse cardiovascular outcome Inclusion criteria: age ≥ 18 years, living in Olmsted county and the surrounding 14 counties, syncope of undetermined cause, intermediate risk for an adverse cardiovascular outcome Exclusion criteria: identified cause of syncope during initial evaluation in the ED, any condition that would require hospital admission, non-syncope syndromes (light-headedness, dizziness, vertigo, pre-syncope, coma, shock, spells, fall, metabolic syndrome, typical seizure presentation, or recurrence of known seizure, or other state of altered mentation, or cardiac arrest) Numbers recruited: 103, 51 in intervention group vs 52 in usual-care group Participants analysed for the primary outcome: 103 Mean age: 64 (SD 17) in intervention group vs 65 (SD 17) in usual-care group Male: 25 (49)% in intervention group vs 25 (48)% in usual-care group
Interventions	Intervention: standardised protocol in ED syncope unit. Protocol consisted of continuous cardiac monitoring in a designated area in the observational unit for up to 6 h, hourly vital signs and orthostatic BP, echocardiography if participants had abnormal cardiovascular examination findings or an abnormal ECG, tilt-table testing in an electrophysiological laboratory near the syncope unit (tilt table testing was only for selected participants). An ED physician and a registered nurse staffed the syncope unit. An electrophysiological consultation was obtained while the participant was in the syncope unit when interpretation of the tilt-table test result or triaging recommendations were needed. If these tests and consultations could not be performed while the participant was in the syncope unit, arrangements for an outpatient consultation at a Heart Rhythm Centre, tilt-table testing, or echocardiography could be made within 72 h after dismissal from the syncope unit. An educational booklet on syncope was given to each participant at the time of dismissal from the syncope unit. The collaborative effort of physician and nursing staff from the ED, cardiovascular diseases, and electrophysiology constituted the multidisciplinary approach in the syncope unit. Usual care: usual care, the ED physician was responsible for making the decision whether further evaluation was required and the setting in which the evaluation should occur. Additional ED diagnostic testing was performed at the discretion of the ED physician on the basis of the participant's history, physical examination, and laboratory findings.
Outcomes	Primary outcome: diagnostic yield (presumptive cause of syncope established) and hospital admission rate Secondary outcomes: net diagnostic yield, length of hospital stay at the completion of the evaluation of the index event, all-cause mortality, and recurrent syncope during follow-up
Notes	Defined time limit of maximum stay in the SSU: 6 h Follow-up: 2 years Trial was stopped early because of poor recruitment. Trial registration: no registration (trial was conducted from 2000-2004) Received additional information from trial authors by 28 February 2017

Risk of bias

Bias	Authors' judgement	Support for judgement

Shen 2004 *(Continued)*

Random sequence generation (selection bias)	Low risk	Computer-generated allocation list
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding of outcome assessors (information by trial authors)
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Trial was stopped early due to poor recruitment
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	High risk	No trial registration (trial conducted 2000-2004). No protocol was described. Trial authors have described outcomes as defined in the methods section
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Strøm 2017a

Methods	Parallel randomised trial Aim of trial: to compare SSU hospitalisation with usual care at an Internal Medicine Department (IMD) in older internal medicine patients Setting: single-centre trial at a secondary, public, teaching hospital, Holbaek, Denmark, January 2015-October 2016 Number of nurses/bed (per daytime/evening/night shifts): 3/2-4/1-2 per 16 beds in intervention group vs 6/3-4/2-3 per 20 beds in usual-care group Number of physicians/bed (per daytime/evening/night shifts): 3/5 available from ED/4 available from ED per 16 beds in intervention group vs 4/2-3 on-call in-house/2 on-call in-house per 20 beds in usual-care group Type of SSU: multipurpose unit
Participants	Participants with any type of internal medicine disease or condition Inclusion criteria: age ≥ 75 years, acutely admitted for an internal medicine disease, and assessed by an ED-physician to be suitable for SSU hospitalisation, green-tag triage (by the Danish Emergency Process Triage) Exclusion criteria: previous participation in the trial, active participation in another clinical trial, lack of Danish civil registration number, residency in another country than Denmark, need of help getting to

Strøm 2017a *(Continued)*

	the toilet in daily life, no awareness of the current date, time and location, no awareness of name and date of birth, no space in the SSU, or if informed consent could not be obtained Numbers recruited: 430, 215 in intervention group vs 215 in usual-care group Participants analysed for the primary outcome: 412 Mean age (IQR): 81 (IQR 76-86) in intervention group vs 82 (IQR 78-86) in usual-care group Male: 97 (47%) in intervention group vs 87 (41%) in usual-care group CCI (0/1/2/3/4/5 or more, n) = 15/26/21/17/11/10 in intervention group vs 20/27/26/13/9/5 in usual-care group
Interventions	Intervention: placement in ED SSU. Discharge planning was initiated immediately after admission to the SSU. If the participant needed further diagnostic tests these were performed on the same terms as in the ED, including point-of-care ultrasonography available around the clock, acute blood samples analysed in the ED's point-of-care laboratory from 8 am-10 pm, and simple X-rays in the ED's X-ray room manned from 10 am-6 pm More advanced diagnostic examinations; such as CT or MRI scans were performed at the department of radiology on a fast-track basis. Participants were encouraged to mobilise as much as possible without assistance during the stay, which usually included getting minimal help to basic self-care activities such as bathing, getting out of bed, or walking around the SSU Usual care: placement in internal medicine department ward, no standardised treatment protocols were applied
Outcomes	Primary outcome: 90-day all-cause mortality Secondary outcomes: mortality rate at conclusion of the trial, in-hospital mortality, adverse events during hospitalisation, change in Lawton IADL-score within 90 days from admission, length of stay in hospital, unplanned hospital readmissions within 30 days after discharge, relocation to a living facility with higher level of care within 90 days from admission, and transfer to another treatment facility during hospitalisation
Notes	Defined time limit of maximum stay in the SSU: 72 h (not hard cut off, if deemed in participant's best interest they were allowed to stay longer) Follow-up: minimum 90 days Trial registration: NCT02395718 Strøm is first author of the current Cochrane Review, the trial paper was assessed by JS and MF. The trial paper was submitted for publication, but not published at the time of the review

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation with variable block size
Allocation concealment (selection bias)	Low risk	Concealed through computer-generated list
Baseline outcome measurement	Low risk	Baseline IADL score reported
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias)	Unclear risk	All analyses were conducted by external statistician, all interpretations done prior to breaking the allocation concealment. Primary outcome was objective,

Strøm 2017a *(Continued)*

All outcomes		i.e. mortality and obtained by up-to-date national register, but secondary outcomes were obtained by research personnel that were not blinded to treatment allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reason for dropouts clearly stated, < 15%
Contamination	High risk	A significant proportion of participants in the SSU (23%) were transferred to the internal medicine department during their hospital stay
Selective reporting (reporting bias)	Low risk	Protocol published, all outcome data measured and reported as stated in protocol
Other bias	Low risk	The trial appeared to be free of other components that could put it at risk of bias
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in one or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Sun 2014

Methods	Parallel randomised trial Aim of trial: to test the primary hypotheses that an ED observation protocol would reduce hospital admissions and hospital length-of-stay Setting: multicentre trial conducted in university-affiliated both public and private EDs (5 sites: Los Angeles (Public), Boston, Royal Oaks, Troy, Durham, USA), March 2010-October 2011 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose units
Participants	Participants with syncope or near-syncope and intermediate risk for subsequent serious outcomes Inclusion criteria: age ≥ 50 years, classified to have intermediate risk for subsequent serious outcomes (risk stratification by semi-structured criteria based upon specialty society criteria) Exclusion criteria: serious condition identified during the ED (e.g. symptomatic arrhythmias, MI, pulmonary embolism), seizure, head trauma, or intoxication as the reason for loss of consciousness, new or baseline cognitive impairment, do-not-resuscitate or do-not-intubate status, active chemotherapy for cancer, and inability to speak either English or Spanish Numbers recruited: 124, 62 in intervention group vs 62 in usual-care group Participants analysed for the primary outcome: 124 Mean age: 65 (SD 11) in intervention group vs 64 (SD 11) in usual-care group Male: 29 (47)% in intervention group vs 32 (52)% in usual-care group
Interventions	Intervention: standardised protocol in ED observation unit, consisting of minimum 12 h of continuous cardiac monitoring, serial troponin test (minimum 2 times), and resting echocardiogram if participants had a cardiac murmur or if a prior rest echocardiogram had not been performed in the prior 6 months. The ED treating teams could perform additional testing at their discretion. The maximum stay in the ED observation unit could not exceed 24 h. Observation protocol participants who were diagnosed with a serious condition, had persistent symptoms of syncope or near-syncope, were felt by the treating

Sun 2014 *(Continued)*

	physician to be unable to be safely discharged home because of functional reasons (e.g. inability to ambulate), or had pending tests at 24 h were admitted to the hospital. All other participants were eligible for discharge. The treating ED team made the final decision to admit or discharge participants. Usual care: routine inpatient admission, inpatient medicine service managed participants. The trial protocol did not guide the care of participants
Outcomes	Primary outcome: hospitalisation rate and hospital length-of-stay (hours) Secondary outcomes: hospital costs, QoL, serious clinical events, patient satisfaction
Notes	Defined time limit of maximum stay in the SSU: 24 h Follow-up: 6 months Trial registration: NCT01003262 Received additional information from trial authors by 28 February 2017 For serious clinical events, additional information on participants lost to follow-up was presented in supplementary online e-material. We re-calculated serious outcomes by adding 'in-hospital serious clinical events' to 'after hospital discharge serious clinical events'

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated block randomisation sequence by site
Allocation concealment (selection bias)	Low risk	Allocation concealment by a computer-generated list
Baseline outcome measurement	Unclear risk	No baseline measure of outcome QoL reported
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Authors explicitly reported loss-to-follow-up data in a supplementary appendix, for primary outcomes hospital admission no participants were missing; for the other primary outcomes, length of stay in hospital, 2 participants in usual-care group were missing (2%). For 30-day serious outcomes after hospital discharge, 3 (5%) in intervention group vs 5 (5%) in usual-care group were missing, and for QoL (quality of well-being score), 14 (23%) in intervention group vs 21 (34%) in usual-care group were missing, hence more than 15% missing data (as defined in our 'Risk of bias' assessment). Missing data seemed equally distributed.
Contamination	High risk	Participants were transferred to inpatient care from SSU if needed
Selective reporting (reporting bias)	Low risk	All outcomes reported in trial registry and methods section were reported with exception of 6-month QoL data and the formal cost-effectiveness analysis (i.e., comparison of the ratio of cost to quality-adjusted life-year), these were secondary outcomes and the reasons for not assessing outcomes were clearly stated (for QoL: this was dropped because of participant complaints

Sun 2014 *(Continued)*

		about survey length and burden; for formal cost-effectiveness analysis: this was dropped because the analysis would not yield additional information compared with the cost-difference analysis)
Other bias	Unclear risk	Potential risk of academic bias (Baugh) Trial authors lowered age inclusion criteria from 60 years to 50 years due to low recruitment rate during the trial period
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

Than 2014

Methods	Parallel randomised trial Aim of trial: to compare the effectiveness of a rapid diagnostic pathway with a standard-care diagnostic pathway for the assessment of participants with possible cardiac chest pain in a usual clinical practice setting Setting: single-centre trial conducted in an urban, tertiary, public, university-affiliated hospital, Christchurch, New Zealand, October 2010-July 2012 Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit
Participants	Participants with chest pain consistent with ACS Inclusion criteria: ≥ 18 years, symptoms consistent with ACS and physician planned further observation/troponin testing for possible MI Exclusion criteria: sT-elevation MI, clear other cause than ACS, inability to provide consent, staff considered recruitment to be inappropriate, chest pain symptoms > 12 h, transfer from other hospital, pregnancy, previous inclusion in trial or inability to be discharged after hospitalisation Numbers recruited: 544, 271 to the intervention group vs 273 to the usual-care group Participants analysed for the primary outcome: 542 Mean age: 60.5 (SD 12.6) in intervention group vs 60.5 (SD 12.6) in usual-care group Male: 171 (63)% in intervention group vs 166 (61)% in usual-care group
Interventions	Intervention: standardised protocol in ED observation unit (calculation of the thrombolysis in MI-score (TIMI), ECG and troponin testing; if TIMI was 0 participants were placed in observation unit for 2 h and ECG and troponin tests were repeated, if these tests were negative the participant was discharged and scheduled to a 72 h outpatient treadmill test. If participant had TIMI score > 0 or positive test results at any time, participants were admitted) Usual care: standard pathway by cardiology service (initial troponin and ECG, prolonged observation and a second troponin test 6-12 h after onset of pain, observation in inward unit. Follow-up appointments depended on the clinician, usually 7-day follow-up with general practitioner)
Outcomes	Primary outcome: successful discharge (discharge within 6 h of ED arrival without a major adverse cardiac adverse event within 30 days)

Than 2014 *(Continued)*

	Secondary outcomes: defined in trial registration to be length of stay in hospital, serious adverse events, proportion of participants that ultimately diagnosed as having acute MI, cost-effectiveness, health utility, satisfaction
Notes	Defined time limit of maximum stay in the SSU: 12-16 h, occasionally longer (information provided by trial authors) Follow-up: 30 days Trial registration: ACTRN12610000766011 Received additional information from trial authors by 28 February 2017 and 13 July 2017

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated block randomisation sequence
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Baseline outcome measurement	Low risk	Baseline outcome measurement not relevant
Baseline characteristics	Low risk	Described and evenly distributed
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessors were blinded for treatment allocations
Incomplete outcome data (attrition bias) All outcomes	Low risk	2 participants were recruited twice (1 in each group) and excluded, these were clearly described and < 15% of included participants, outcomes for all other participants were reported
Contamination	High risk	41 participants in intervention group received usual care, and 3 participants in usual-care group received intervention care
Selective reporting (reporting bias)	Unclear risk	In the trial registration, trial authors reported to assess additional outcomes that were not reported in the manuscript (EQ-5D, costs, satisfaction) for reasons not stated, we received the results of these outcomes after contact with trial authors
Other bias	Unclear risk	Potential risk of academic bias (trial author Goodacre had published several trials on SSUs) The trial appeared to be free of other components that could put it at risk of bias.
Overall risk of bias All outcomes	High risk	High risk of bias and/or unclear risk of bias in 1 or more domains: blinding of outcome assessment, incomplete outcome data, or selective reporting

ACC: American College of Cardiology; **ACS**: acute coronary syndrome; **AF**: atrial fibrillation; **AHA**: American Heart Association; **BP**: blood pressure; **bpm**: beats per minute; **CBC:** complete blood count **CCI: Charlson comorbidity index CPU**: chest pain unit; **CK-MB**: Creatine Kinase Myocardial B-fraction; **CT**: computed tomography; **IADL**: instrumental activities of daily living; **iv**: intravenous; **ECG**: electrocardiogram; **ED**: emergency department; **IQR**: interquartile range; **MI**: myocardial infarction; **mph**: miles per hour; **MRI**: magnetic resonance imaging; **NA**: not applicable; **NYHA**: New York Heart Association; **OARS-IADL**: Older Americans Resources and Services instrumental Activities of Daily Living-score; **QoL**: quality of life; **SD**: standard deviation; **SSU**: short-stay unit

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Abdelaziz 2016	Ineligible intervention
Aggarwal 1995	Ineligible study design
Aitken 1993	Ineligible intervention
Alonso 2010	Ineligible study design
Applegate 1990	Ineligible intervention
Applegate 1991	Ineligible intervention
Arendts 2006	Ineligible study design
Asplund 2000	Ineligible intervention
Barbado 1999	Ineligible study design
Barberger-Gateau 1986	Ineligible study design
Barberger-Gateau 1989	Ineligible study design
Barnes 2012	Ineligible intervention
Basic 2009	Ineligible study design
Baugh 2011	Ineligible study design
Baugh 2012	Ineligible study design
Baugh 2014	Ineligible study design
Blecker 2014	Ineligible study design
Bogaty 2001	Ineligible comparator
Broquetas 2008	Ineligible study design
Bullard 2007	Ineligible study design; quasi-randomised trial, but randomised days not participants to either SSU care or traditional care
Burkhardt 2005	Ineligible study design
Carpentier 2001	Ineligible study design
Caterino 2013	Ineligible study design
Chen 2005	Ineligible study design
Cheng 2016	Ineligible study design
Choi 1999	Ineligible study design

Study	Reason for exclusion
Claesson 2000	Ineligible intervention
Claesson 2003	Ineligible study design
Clemson 2016	Ineligible intervention
Cochard 1999	Ineligible study design
Collier 2007	Ineligible intervention
Collins 2013	Ineligible study design
Corbella 2002	Ineligible study design
Covinsky 1997	Ineligible intervention
Cross 2010	Ineligible study design
Cruz 2001	Ineligible study design
Dallos 1981	Ineligible study design
Deng 2004	Ineligible intervention
Diagana 2008	Ineligible study design
Downing 2008	Ineligible study design
Ekdahl 2014	Ineligible intervention
Ekerstad 2017	Ineligible intervention
Fagerberg 2000	Ineligible intervention
Farkouh 1997	Copy of another reference found in search
Fayas 2013	Ineligible study design
Fung 2007	Ineligible study design
Furlanetto 2014	Ineligible study design
Gaspoz 1994	Ineligible study design
Germain 1995	Ineligible intervention
Ghaemmaghami 2009	Ineligible study design
Goodacre 1998	Ineligible study design
Goodacre 2004	Ineligible study design (quasi-randomised trial)
Goodacre 2007	Ineligible study design
Harper 1988	Ineligible study design

Study	Reason for exclusion
Harris 1991	Ineligible intervention
Harrison 2003	Ineligible patient population
ISRCTN21800480	Ineligible intervention
Jagminas 2005	Ineligible study design
Juan 2006	Ineligible study design
Juan 2010	Ineligible study design
Kam 2008	Ineligible study design
Kelen 2001	Ineligible study design
Khan 1997	Ineligible study design
Koton 2005	Ineligible intervention
Llopis 2015	Ineligible study design
Llopis 2016	Ineligible study design
Mahler 2013	Ineligible study design
Mahler 2015	Ineligible intervention
Martín-Sánchez 2014	Ineligible study design
Michael 2014	Ineligible study design
Miller 2011	Ineligible comparator
Miller 2012	Copy of another reference found in search
Mitchell 2009	Ineligible study design
Muñoz 2006	Ineligible study design
Navarrete 2016	Ineligible intervention
NCT02421133	Ineligible intervention
Ross 2004	Commentary
Rubenstein 1984	Ineligible intervention
Rubenstein 1988	Ineligible intervention
Salazar 2006	Ineligible study design

Characteristics of ongoing studies *[ordered by study ID]*

NCT03302910

Trial name or title	Short Stay Unit vs Hospitalization in Acute Heart Failure (SSU-AHF)
Methods	Parallel randomised trial Aim of trial: to test whether short stay-unit AHF management for < 24 h increases days-alive-and-out-of-hospital, QoL assessment, caregiver burden, and costs compared to inpatient management Setting: multicentre study (3 centres), USA Number of nurses/bed: unclear Number of physicians/bed: unclear Type of SSU: multipurpose unit
Participants	Participants with AHF Inclusion criteria: Clinical diagnosis of AHF, Systolic BP > 115 mmHg, heart rate < 115 bpm, oxygen saturation > 93% on room air, and previous history of heart failure Exclusion criteria: Transplanted organ of any kind or ventricular assist device patient; end-stage renal disease, on dialysis, or estimated glomerular filtration rate < 30 mL/min; ACS (e.g. ECG changes consistent with ischaemia or troponin elevation secondary to ACS); other acute co-morbid conditions (e.g. sepsis, altered mental status) that are unlikely to be treated within a SSU stay; high risk lab values, specifically haemoglobin < 9, sodium < 135; people who require ventilatory support of any kind or iv vasodilators/vasopressor/inotropic support. People who receive a one-time dose of an iv vasodilator, but are no longer on this medication, are eligible; pregnant women or any woman who has been pregnant in the last 3 months; < 18 years of age; anyone who in the opinion of the clinician or investigator requires hospitalisation or ICU-level care or will require rehabilitation or skilled nursing after discharge from the ED or hospital; planned discharge from the ED
Interventions	Intervention: SSU hospitalisation for an approximately 23 h-long treatment and observation period Usual care: inpatient hospitalisation
Outcomes	Primary outcome: days alive and out of hospital Secondary outcomes: QoL, cost-effectiveness analysis, caregiver burden, modified resource utilisation questionnaire, all-cause mortality and re-hospitalisation, days alive and out of hospital
Starting date	December 6th 2017
Contact information	Dr. Peter S. Pang, MD. Phone: 312-515-4025, email: ppang@iu.edu
Notes	Estimated completion date: 31 March 2021 Trial registration: NCT03302910

ACS: acute coronary syndrome; **AHF**: acute heart failure; **BP**: blood pressure; **bpm**: beats per minute; **ED**: emergency department; **ICU**: intensive care unit; **h**: hour, **iv**: intravenous; **QoL**: quality of life; **SSU**: short-stay unit

DATA AND ANALYSES

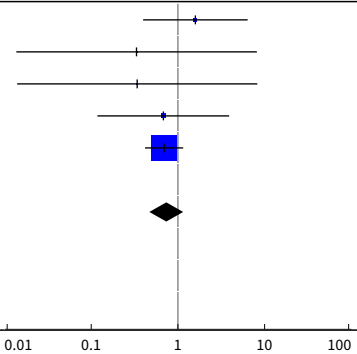
Comparison 1. Mortality in participants treated in short-stay unit vs usual care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality at time point closest to 90 days	5	1294	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.47, 1.15]
2 Mortality at time point closest to 90 days best-worst case scenario	5	1318	Risk Ratio (M-H, Random, 95% CI)	0.57 [0.37, 0.87]
3 Mortality at time point closest to 90 days worst-best case scenario	5	1318	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.57, 1.94]
4 Mortality at time point closest to 90 days published trials	3	749	Risk Ratio (M-H, Random, 95% CI)	0.52 [0.13, 2.08]
5 Mortality at time point closest to 90 days and outcome assessed within 6 months of randomisation	4	1191	Risk Ratio (M-H, Random, 95% CI)	0.74 [0.46, 1.18]
6 Mortality at time point closest to 90 days multipurpose unit vs specialised unit	5	1294	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.47, 1.15]
6.1 Multipurpose unit	3	767	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.47, 1.21]
6.2 Specialised unit	2	527	Risk Ratio (M-H, Random, 95% CI)	0.58 [0.12, 2.67]
7 Mortality at time point closest to 90 days non-protocol-based vs protocol-based care	5	1294	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.47, 1.15]
7.1 Non-protocol-based care	2	545	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.43, 1.52]
7.2 Protocol-based care	3	749	Risk Ratio (M-H, Random, 95% CI)	0.52 [0.13, 2.08]
8 Mortality at time point closest to 90 days older participants vs younger participants	5	1294	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.47, 1.15]
8.1 Older participants	2	545	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.43, 1.52]
8.2 Younger participants	3	749	Risk Ratio (M-H, Random, 95% CI)	0.52 [0.13, 2.08]
9 Mortality at maximum follow-up	5	1277	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.62, 1.13]
10 Mortality at maximum follow-up best-worst case scenario	5	1318	Risk Ratio (M-H, Random, 95% CI)	0.67 [0.50, 0.88]
11 Mortality at maximum follow-up worst-best case scenario	5	1318	Risk Ratio (M-H, Random, 95% CI)	1.17 [0.73, 1.89]

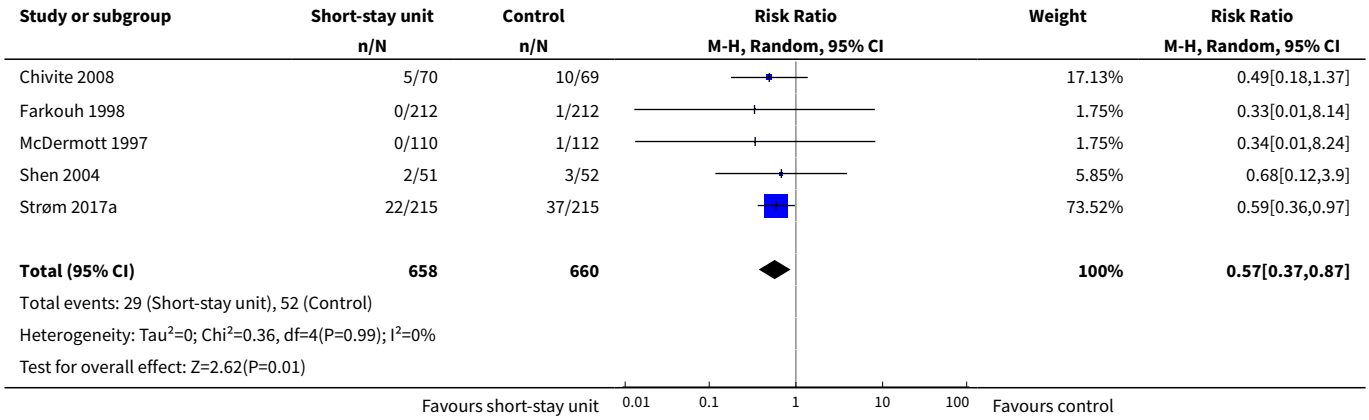
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
12 Mortality at maximum follow-up published trials	3	732	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.51, 1.66]
13 Mortality at maximum follow-up and outcome assessed within 6 months of randomisation	4	1174	Risk Ratio (M-H, Random, 95% CI)	0.84 [0.62, 1.13]
14 Mortality at maximum follow-up multipurpose unit vs specialised unit	5	1277	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.62, 1.13]
14.1 Multipurpose unit	3	767	Risk Ratio (M-H, Fixed, 95% CI)	0.80 [0.57, 1.13]
14.2 Specialised unit	2	510	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.52, 1.73]
15 Mortality at maximum follow-up non-protocol-based vs protocol-based care	5	1277	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.62, 1.13]
15.1 Non-protocol-based care	2	545	Risk Ratio (M-H, Fixed, 95% CI)	0.81 [0.58, 1.15]
15.2 Protocol-based care	3	732	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.50, 1.63]
16 Mortality at maximum follow-up older vs younger participants	5	1277	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.62, 1.13]
16.1 Older participants	2	545	Risk Ratio (M-H, Fixed, 95% CI)	0.81 [0.58, 1.15]
16.2 Younger participants	3	732	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.50, 1.63]

Analysis 1.1. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 1 Mortality at time point closest to 90 days.

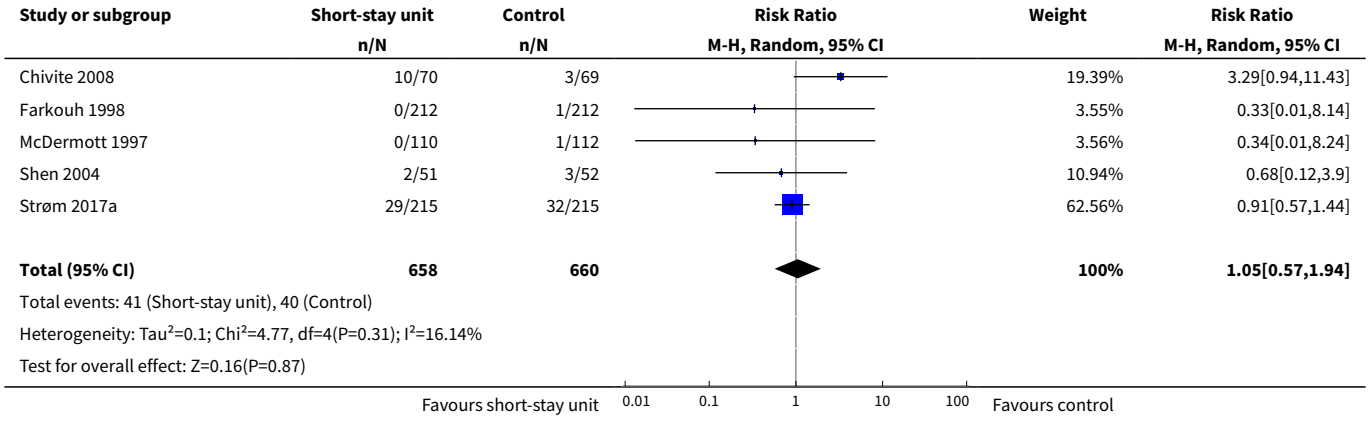
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	5/65	3/62		10.54%	1.59[0.4,6.37]
Farkouh 1998	0/212	1/212		1.99%	0.33[0.01,8.14]
McDermott 1997	0/110	1/112		2%	0.34[0.01,8.24]
Shen 2004	2/51	3/52		6.66%	0.68[0.12,3.9]
Strøm 2017a	22/208	32/210		78.81%	0.69[0.42,1.15]
Total (95% CI)	**646**	**648**		**100%**	**0.73[0.47,1.15]**
Total events: 29 (Short-stay unit), 40 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.7, df=4(P=0.79); I^2=0%					
Test for overall effect: Z=1.34(P=0.18)					



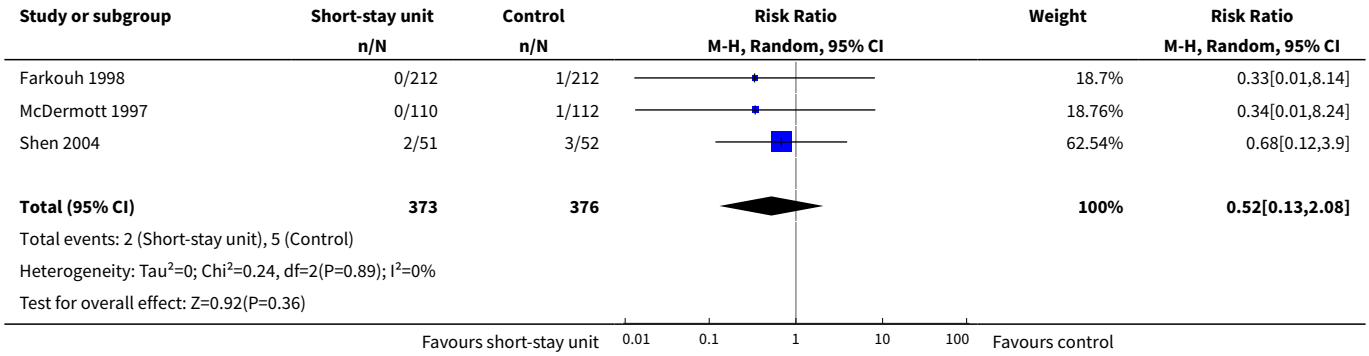
Analysis 1.2. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 2 Mortality at time point closest to 90 days best-worst case scenario.



Analysis 1.3. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 3 Mortality at time point closest to 90 days worst-best case scenario.



Analysis 1.4. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 4 Mortality at time point closest to 90 days published trials.



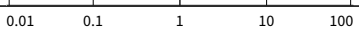
Analysis 1.5. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 5 Mortality at time point closest to 90 days and outcome assessed within 6 months of randomisation.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	5/65	3/62		11.3%	1.59[0.4,6.37]
Farkouh 1998	0/212	1/212		2.13%	0.33[0.01,8.14]
McDermott 1997	0/110	1/112		2.14%	0.34[0.01,8.24]
Strøm 2017a	22/208	32/210		84.43%	0.69[0.42,1.15]
Total (95% CI)	**595**	**596**		**100%**	**0.74[0.46,1.18]**
Total events: 27 (Short-stay unit), 37 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.7, df=3(P=0.64); I^2=0%					
Test for overall effect: Z=1.27(P=0.2)					

Favours short-stay unit — Favours control

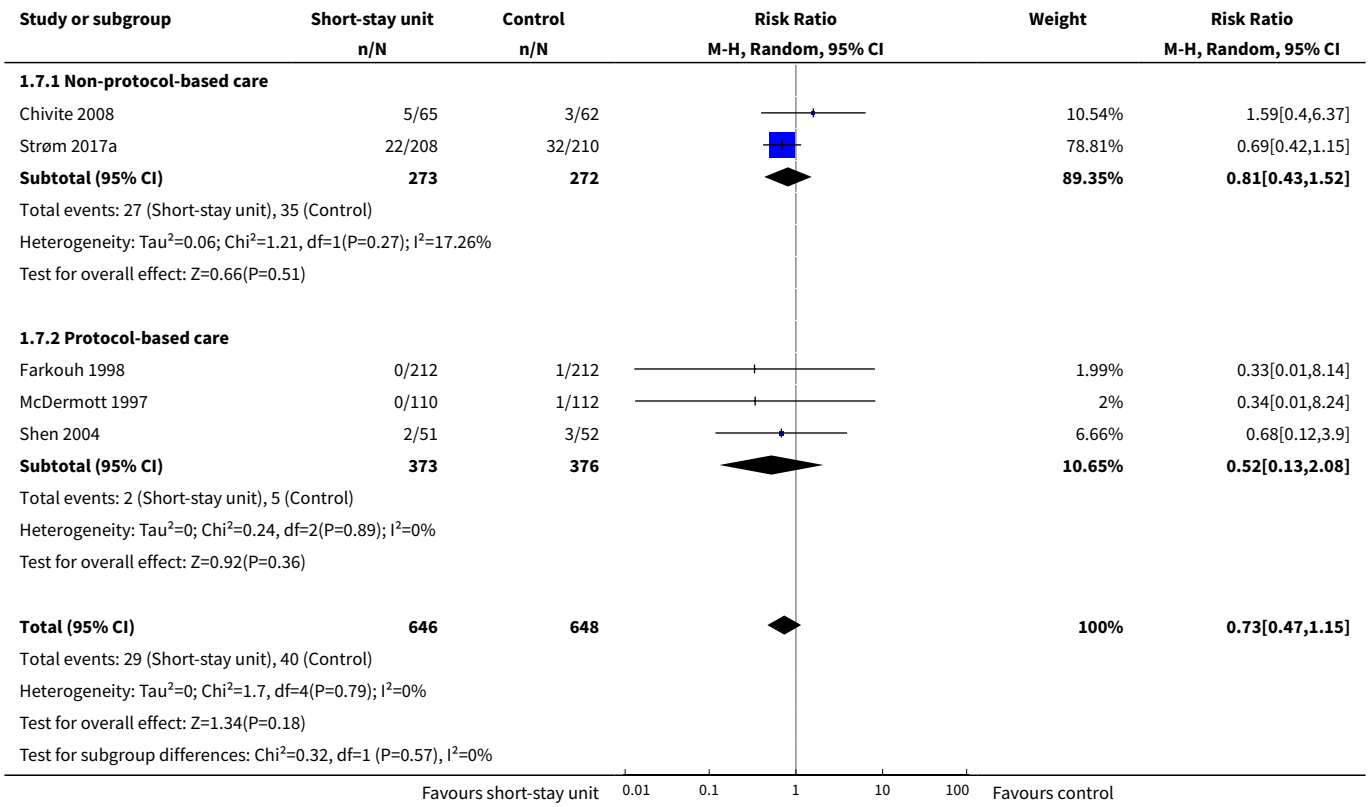
Analysis 1.6. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 6 Mortality at time point closest to 90 days multipurpose unit vs specialised unit.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
1.6.1 Multipurpose unit					
Chivite 2008	5/65	3/62		10.54%	1.59[0.4,6.37]
McDermott 1997	0/110	1/112		2%	0.34[0.01,8.24]
Strøm 2017a	22/208	32/210		78.81%	0.69[0.42,1.15]
Subtotal (95% CI)	**383**	**384**		**91.35%**	**0.75[0.47,1.21]**
Total events: 27 (Short-stay unit), 36 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.45, df=2(P=0.48); I^2=0%					
Test for overall effect: Z=1.18(P=0.24)					
1.6.2 Specialised unit					
Farkouh 1998	0/212	1/212		1.99%	0.33[0.01,8.14]
Shen 2004	2/51	3/52		6.66%	0.68[0.12,3.9]
Subtotal (95% CI)	**263**	**264**		**8.65%**	**0.58[0.12,2.67]**
Total events: 2 (Short-stay unit), 4 (Control)					
Heterogeneity: Tau^2=0; Chi^2=0.15, df=1(P=0.7); I^2=0%					
Test for overall effect: Z=0.7(P=0.48)					
Total (95% CI)	**646**	**648**		**100%**	**0.73[0.47,1.15]**
Total events: 29 (Short-stay unit), 40 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.7, df=4(P=0.79); I^2=0%					
Test for overall effect: Z=1.34(P=0.18)					
Test for subgroup differences: Chi^2=0.1, df=1 (P=0.75), I^2=0%					

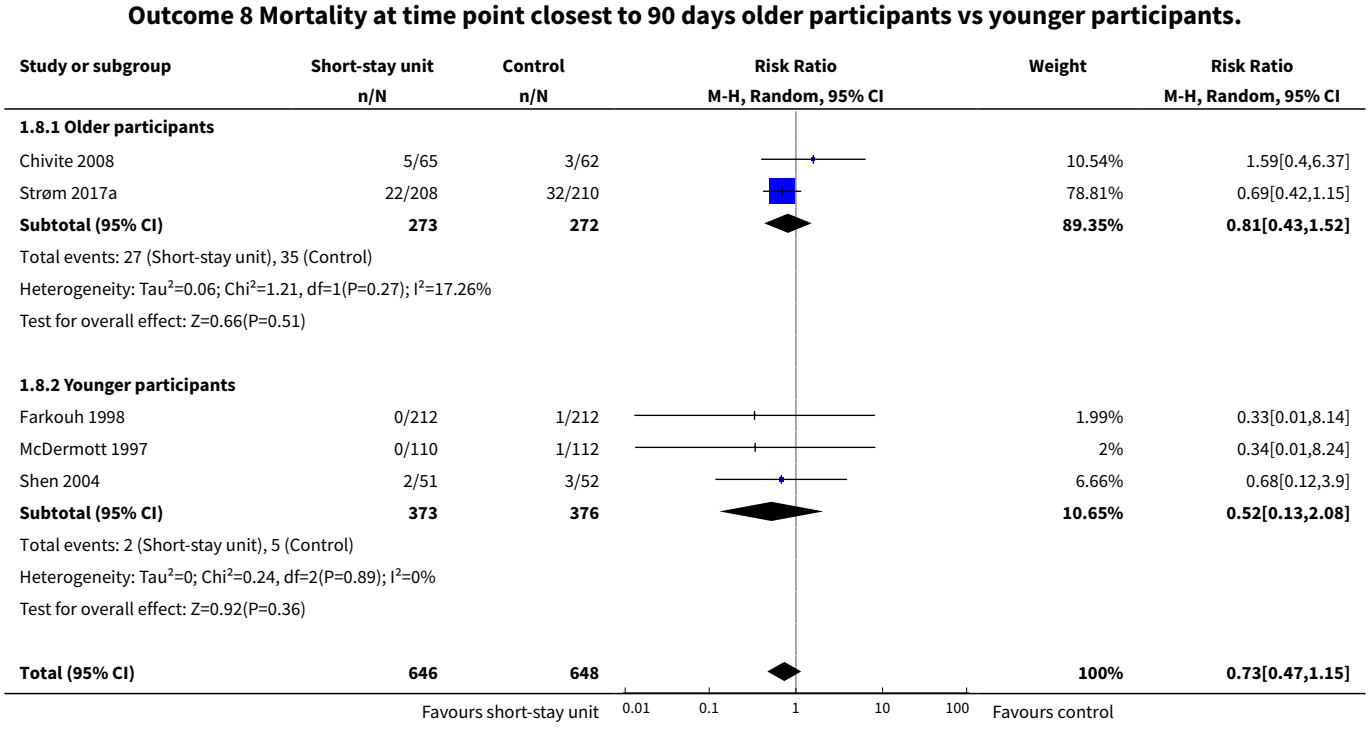


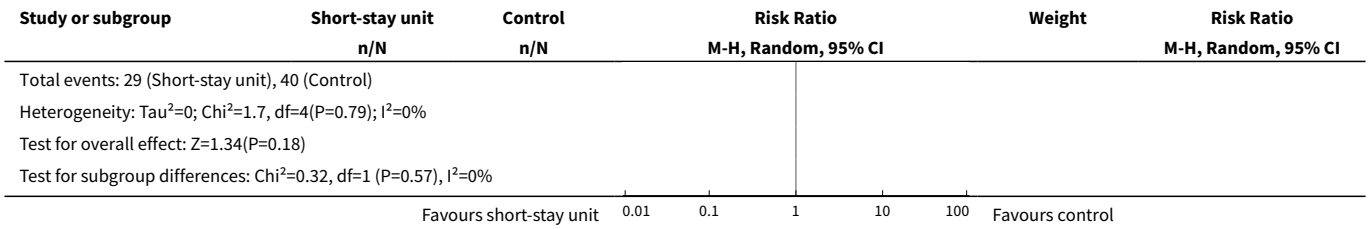
Favours short-stay unit — Favours control

Analysis 1.7. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 7 Mortality at time point closest to 90 days non-protocol-based vs protocol-based care.

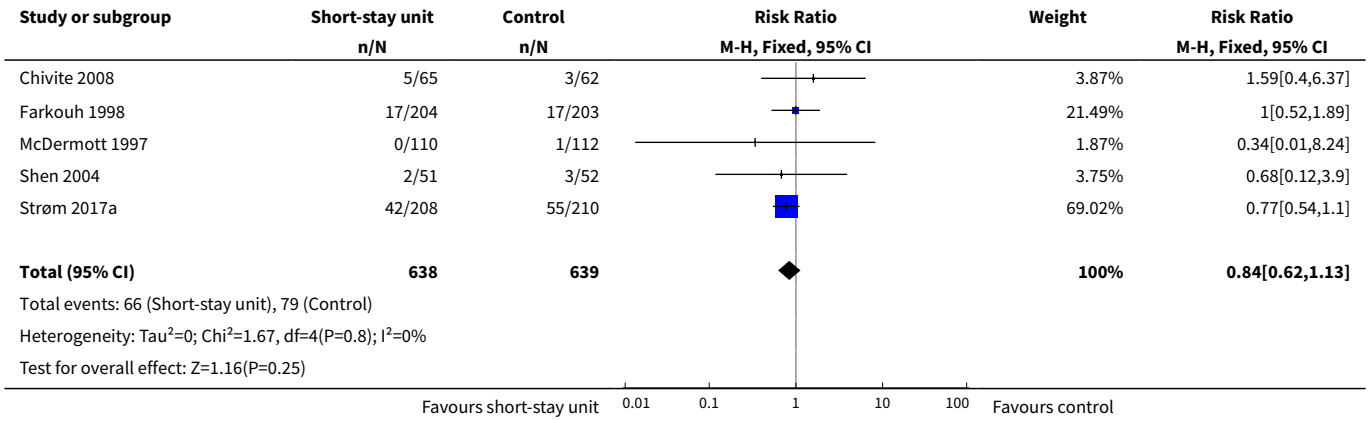


Analysis 1.8. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 8 Mortality at time point closest to 90 days older participants vs younger participants.

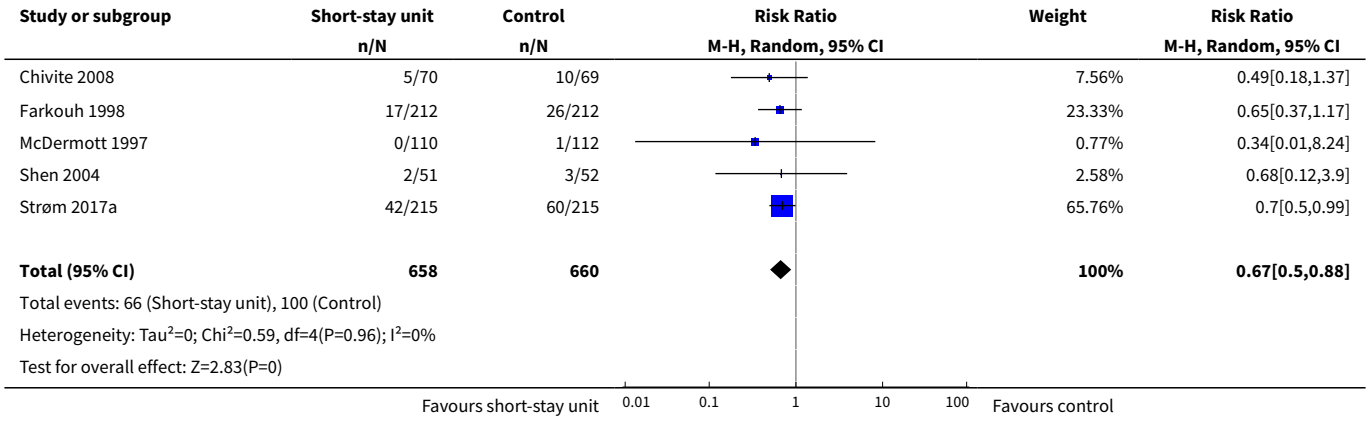




Analysis 1.9. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 9 Mortality at maximum follow-up.

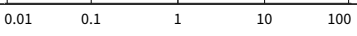


Analysis 1.10. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 10 Mortality at maximum follow-up best-worst case scenario.



Analysis 1.11. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 11 Mortality at maximum follow-up worst-best case scenario.

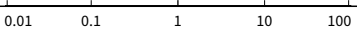
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	10/70	3/69		11.78%	3.29[0.94,11.43]
Farkouh 1998	25/212	17/212		31.97%	1.47[0.82,2.64]
McDermott 1997	0/110	1/112		2.14%	0.34[0.01,8.24]
Shen 2004	2/51	3/52		6.61%	0.68[0.12,3.9]
Strøm 2017a	49/215	55/215		47.49%	0.89[0.64,1.25]
Total (95% CI)	**658**	**660**		**100%**	**1.17[0.73,1.89]**
Total events: 86 (Short-stay unit), 79 (Control)					
Heterogeneity: Tau²=0.09; Chi²=6.19, df=4(P=0.19); I²=35.37%					
Test for overall effect: Z=0.66(P=0.51)					



Favours short-stay unit — Favours control

Analysis 1.12. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 12 Mortality at maximum follow-up published trials.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Farkouh 1998	17/204	17/203		85%	1[0.52,1.89]
McDermott 1997	0/110	1/112		3.46%	0.34[0.01,8.24]
Shen 2004	2/51	3/52		11.54%	0.68[0.12,3.9]
Total (95% CI)	**365**	**367**		**100%**	**0.92[0.51,1.66]**
Total events: 19 (Short-stay unit), 21 (Control)					
Heterogeneity: Tau²=0; Chi²=0.55, df=2(P=0.76); I²=0%					
Test for overall effect: Z=0.28(P=0.78)					



Favours short-stay unit — Favours control

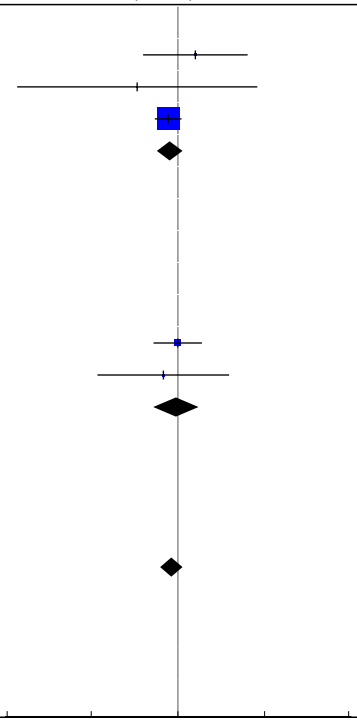
Analysis 1.13. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 13 Mortality at maximum follow-up and outcome assessed within 6 months of randomisation.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	5/65	3/62		4.69%	1.59[0.4,6.37]
Farkouh 1998	17/204	17/203		21.83%	1[0.52,1.89]
McDermott 1997	0/110	1/112		0.89%	0.34[0.01,8.24]
Strøm 2017a	42/208	55/210		72.59%	0.77[0.54,1.1]
Total (95% CI)	**587**	**587**		**100%**	**0.84[0.62,1.13]**
Total events: 64 (Short-stay unit), 76 (Control)					
Heterogeneity: Tau²=0; Chi²=1.62, df=3(P=0.66); I²=0%					
Test for overall effect: Z=1.16(P=0.25)					

Favours short-stay unit — Favours control

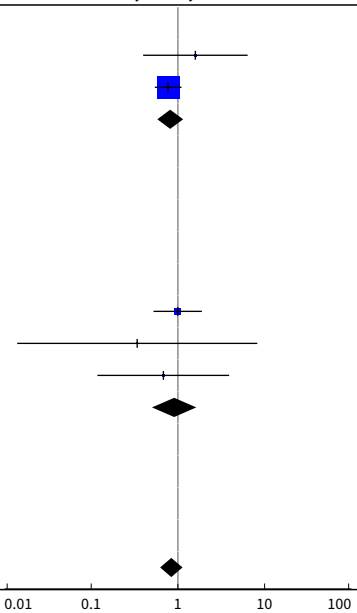
Analysis 1.14. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 14 Mortality at maximum follow-up multipurpose unit vs specialised unit.

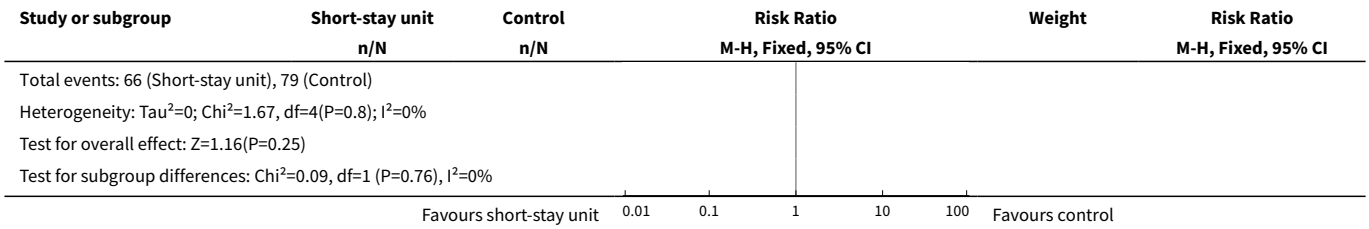
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.14.1 Multipurpose unit					
Chivite 2008	5/65	3/62		3.87%	1.59[0.4,6.37]
McDermott 1997	0/110	1/112		1.87%	0.34[0.01,8.24]
Strøm 2017a	42/208	55/210		69.02%	0.77[0.54,1.1]
Subtotal (95% CI)	**383**	**384**		**74.77%**	**0.8[0.57,1.13]**
Total events: 47 (Short-stay unit), 59 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.26, df=2(P=0.53); I^2=0%					
Test for overall effect: Z=1.27(P=0.2)					
1.14.2 Specialised unit					
Farkouh 1998	17/204	17/203		21.49%	1[0.52,1.89]
Shen 2004	2/51	3/52		3.75%	0.68[0.12,3.9]
Subtotal (95% CI)	**255**	**255**		**25.23%**	**0.95[0.52,1.73]**
Total events: 19 (Short-stay unit), 20 (Control)					
Heterogeneity: Tau^2=0; Chi^2=0.16, df=1(P=0.69); I^2=0%					
Test for overall effect: Z=0.17(P=0.86)					
Total (95% CI)	**638**	**639**		**100%**	**0.84[0.62,1.13]**
Total events: 66 (Short-stay unit), 79 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.67, df=4(P=0.8); I^2=0%					
Test for overall effect: Z=1.16(P=0.25)					
Test for subgroup differences: Chi^2=0.22, df=1 (P=0.64), I^2=0%					



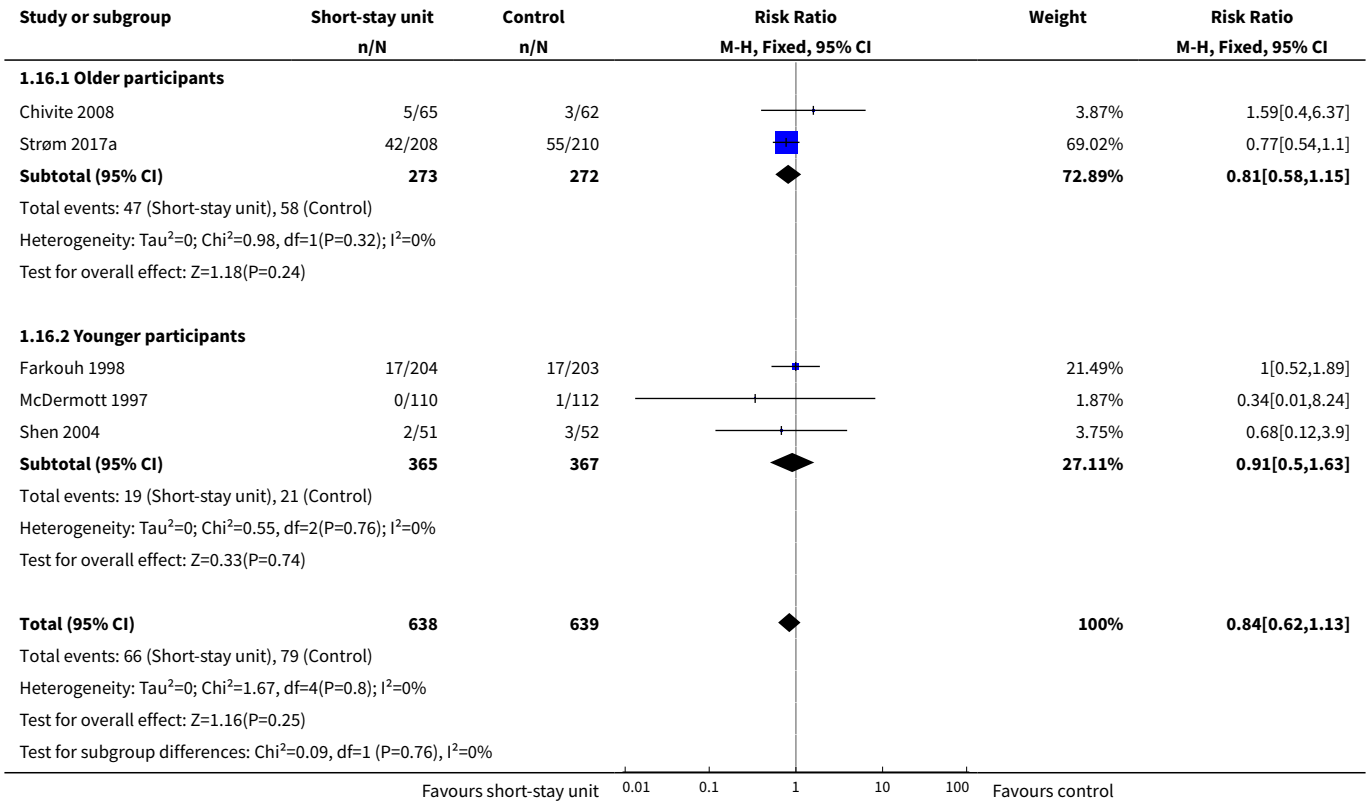
Analysis 1.15. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 15 Mortality at maximum follow-up non-protocol-based vs protocol-based care.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.15.1 Non-protocol-based care					
Chivite 2008	5/65	3/62		3.87%	1.59[0.4,6.37]
Strøm 2017a	42/208	55/210		69.02%	0.77[0.54,1.1]
Subtotal (95% CI)	**273**	**272**		**72.89%**	**0.81[0.58,1.15]**
Total events: 47 (Short-stay unit), 58 (Control)					
Heterogeneity: Tau^2=0; Chi^2=0.98, df=1(P=0.32); I^2=0%					
Test for overall effect: Z=1.18(P=0.24)					
1.15.2 Protocol-based care					
Farkouh 1998	17/204	17/203		21.49%	1[0.52,1.89]
McDermott 1997	0/110	1/112		1.87%	0.34[0.01,8.24]
Shen 2004	2/51	3/52		3.75%	0.68[0.12,3.9]
Subtotal (95% CI)	**365**	**367**		**27.11%**	**0.91[0.5,1.63]**
Total events: 19 (Short-stay unit), 21 (Control)					
Heterogeneity: Tau^2=0; Chi^2=0.55, df=2(P=0.76); I^2=0%					
Test for overall effect: Z=0.33(P=0.74)					
Total (95% CI)	**638**	**639**		**100%**	**0.84[0.62,1.13]**





Analysis 1.16. Comparison 1 Mortality in participants treated in short-stay unit vs usual care, Outcome 16 Mortality at maximum follow-up older vs younger participants.



Comparison 2. Serious adverse events in participants treated in short-stay unit vs usual care

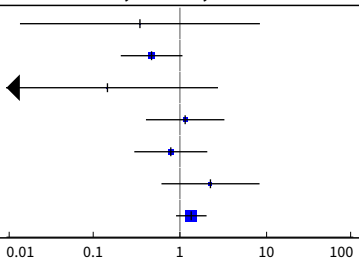
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Serious adverse events at time point closest to 90-days	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
2 Serious adverse events at time point closest to 90 days best-worst case scenario	7	1929	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.50, 1.26]
3 Serious adverse events at time point closest to 90 days worst-best case scenario	7	1929	Risk Ratio (M-H, Random, 95% CI)	1.13 [0.67, 1.89]

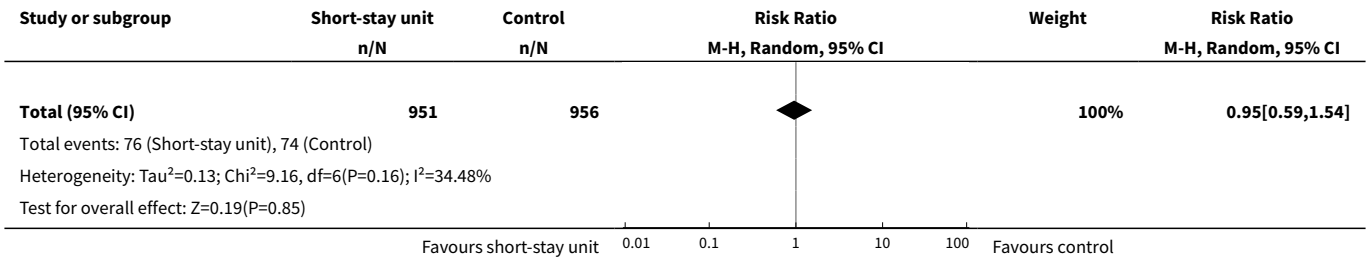
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4 Serious adverse events at time point closest to 90-days published trials	6	1489	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.54, 1.73]
5 Serious adverse events at time point closest to 90-days and outcome assessed within 6 months of randomisation	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
6 Serious adverse events at time point closest to 90 days multipurpose unit vs specialised unit	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
6.1 multipurpose unit	6	1483	Risk Ratio (M-H, Random, 95% CI)	1.23 [0.88, 1.72]
6.2 Specialised units	1	424	Risk Ratio (M-H, Random, 95% CI)	0.47 [0.21, 1.07]
7 Serious adverse events at time point closest to 90-days non-protocol-based vs protocol-based care	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
7.1 Non protocol-based care	1	418	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.30, 2.07]
7.2 Protocol-based care	6	1489	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.54, 1.73]
8 Serious adverse events at time point closest to 90-days older vs younger participants	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
8.1 Older participants	1	418	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.30, 2.07]
8.2 Younger participants	6	1489	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.54, 1.73]
9 Serious adverse events at maximum follow-up	8	1988	Risk Ratio (M-H, Random, 95% CI)	1.11 [0.87, 1.41]
10 Serious adverse events multipurpose unit at maximum follow-up best-worst case scenario	8	2039	Risk Ratio (M-H, Random, 95% CI)	0.83 [0.60, 1.16]
11 Serious adverse events multipurpose unit at maximum follow-up worst-best case scenario	8	2039	Risk Ratio (M-H, Random, 95% CI)	1.35 [1.07, 1.70]
12 Serious adverse events multipurpose unit at maximum follow-up published trials	7	1570	Risk Ratio (M-H, Random, 95% CI)	1.13 [0.88, 1.46]
13 Serious adverse events multipurpose unit at maximum follow-up and outcome	8	1988	Risk Ratio (M-H, Random, 95% CI)	1.11 [0.87, 1.41]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
assessed within 6 months of randomisation				
14 Serious adverse events at maximum follow-up multipurpose unit vs specialised unit	8	1988	Risk Ratio (M-H, Random, 95% CI)	1.11 [0.87, 1.41]
14.1 Multipurpose unit	7	1581	Risk Ratio (M-H, Random, 95% CI)	1.14 [0.83, 1.56]
14.2 Specialised unit	1	407	Risk Ratio (M-H, Random, 95% CI)	1.07 [0.73, 1.56]
15 Serious adverse events at maximum follow-up non-protocol-based vs protocol-based care	8	1988	Risk Ratio (M-H, Random, 95% CI)	1.11 [0.87, 1.41]
15.1 Non-protocol-based care	1	418	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.30, 2.07]
15.2 Protocol-based care	7	1570	Risk Ratio (M-H, Random, 95% CI)	1.13 [0.88, 1.46]
16 Serious adverse events at maximum follow-up older participants vs younger participants	8	1988	Risk Ratio (M-H, Random, 95% CI)	1.11 [0.87, 1.41]
16.1 Older participants	1	418	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.30, 2.07]
16.2 Younger participants	7	1570	Risk Ratio (M-H, Random, 95% CI)	1.13 [0.88, 1.46]
17 Serious adverse events at time point closest to 90 days	7	1907	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
18 Serious adverse events at time point closest to 90 days w/o Farkouh 1998	6	1483	Risk Ratio (M-H, Random, 95% CI)	1.23 [0.88, 1.72]

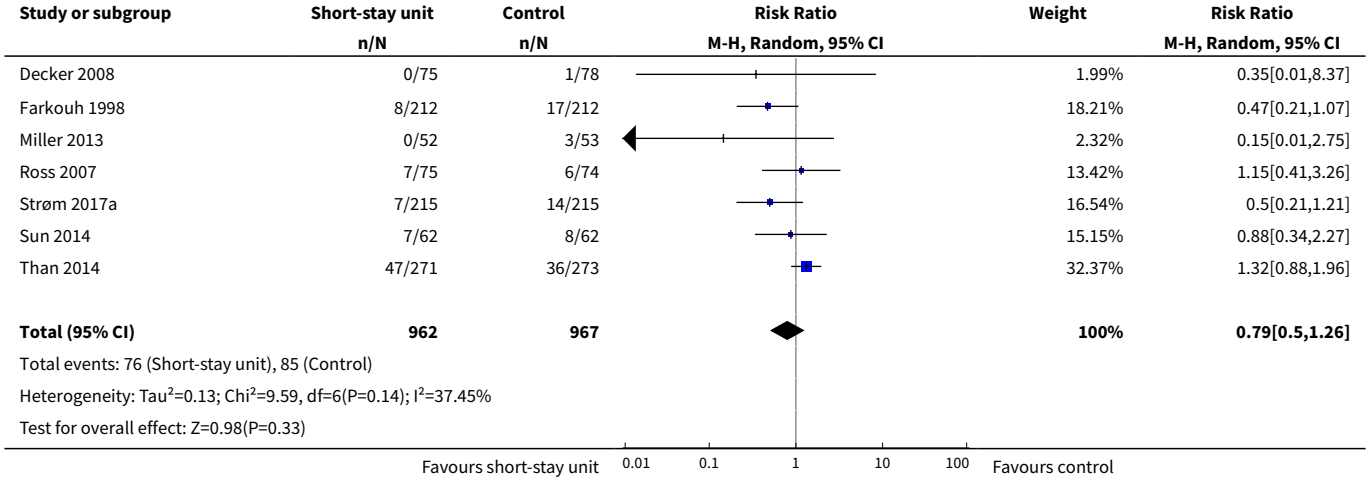
Analysis 2.1. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 1 Serious adverse events at time point closest to 90-days.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		2.15%	0.35[0.01,8.37]
Farkouh 1998	8/212	17/212		19.66%	0.47[0.21,1.07]
Miller 2013	0/52	3/53		2.51%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		14.49%	1.15[0.41,3.26]
Strøm 2017a	7/208	9/210		15.97%	0.79[0.3,2.07]
Sun 2014	7/59	3/57		10.45%	2.25[0.61,8.29]
Than 2014	47/270	35/272		34.77%	1.35[0.9,2.03]

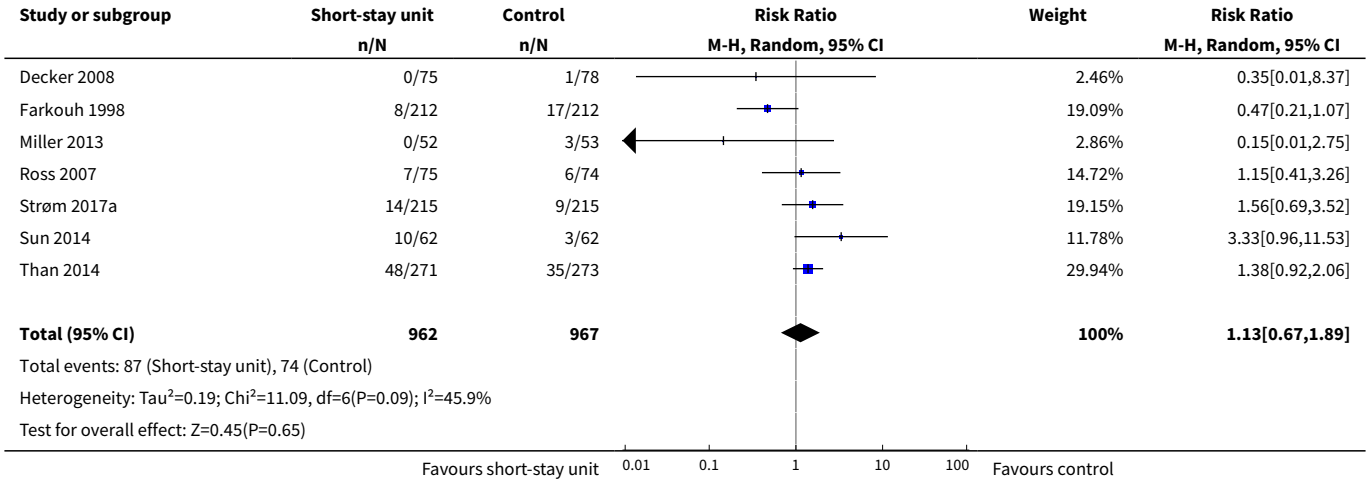




Analysis 2.2. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 2 Serious adverse events at time point closest to 90 days best-worst case scenario.



Analysis 2.3. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 3 Serious adverse events at time point closest to 90 days worst-best case scenario.



Analysis 2.4. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 4 Serious adverse events at time point closest to 90-days published trials.

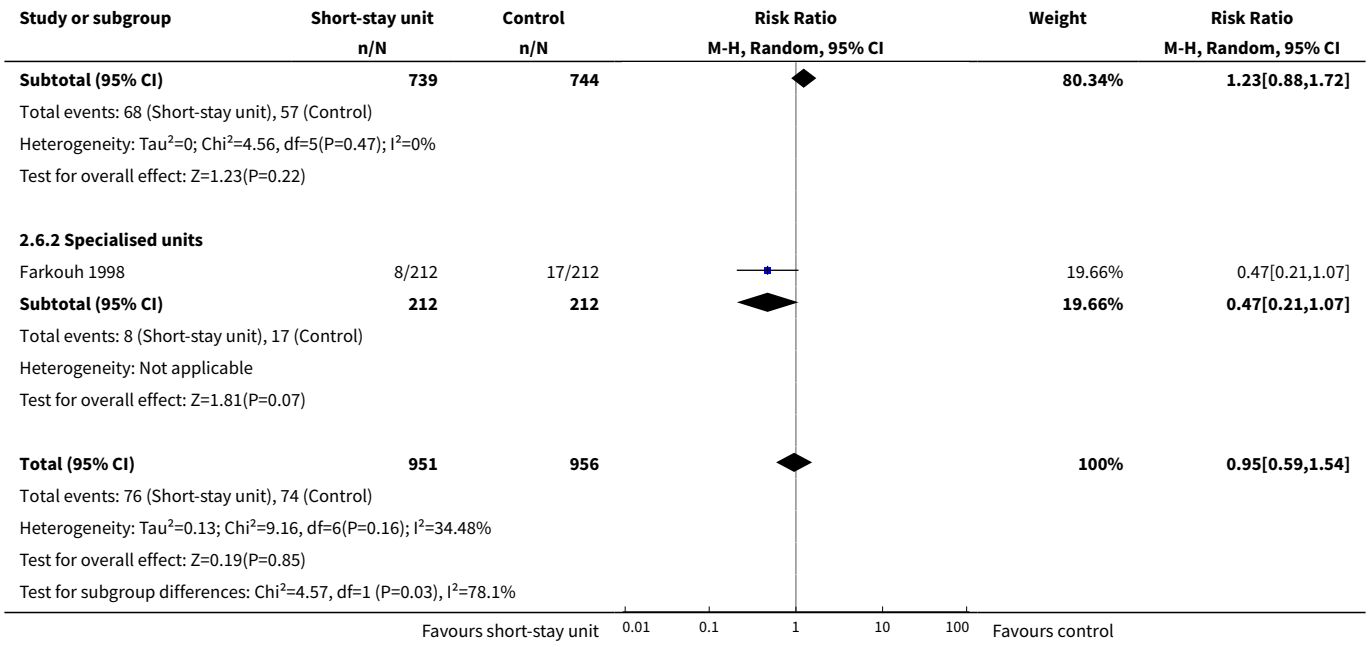
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		3.11%	0.35[0.01,8.37]
Farkouh 1998	8/212	17/212		23.86%	0.47[0.21,1.07]
Miller 2013	0/52	3/53		3.61%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		18.45%	1.15[0.41,3.26]
Sun 2014	7/59	3/57		13.84%	2.25[0.61,8.29]
Than 2014	47/270	35/272		37.12%	1.35[0.9,2.03]
Total (95% CI)	**743**	**746**		**100%**	**0.97[0.54,1.73]**
Total events: 69 (Short-stay unit), 65 (Control)					
Heterogeneity: Tau^2=0.19; Chi^2=8.71, df=5(P=0.12); I^2=42.62%					
Test for overall effect: Z=0.11(P=0.92)					

Analysis 2.5. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 5 Serious adverse events at time point closest to 90-days and outcome assessed within 6 months of randomisation.

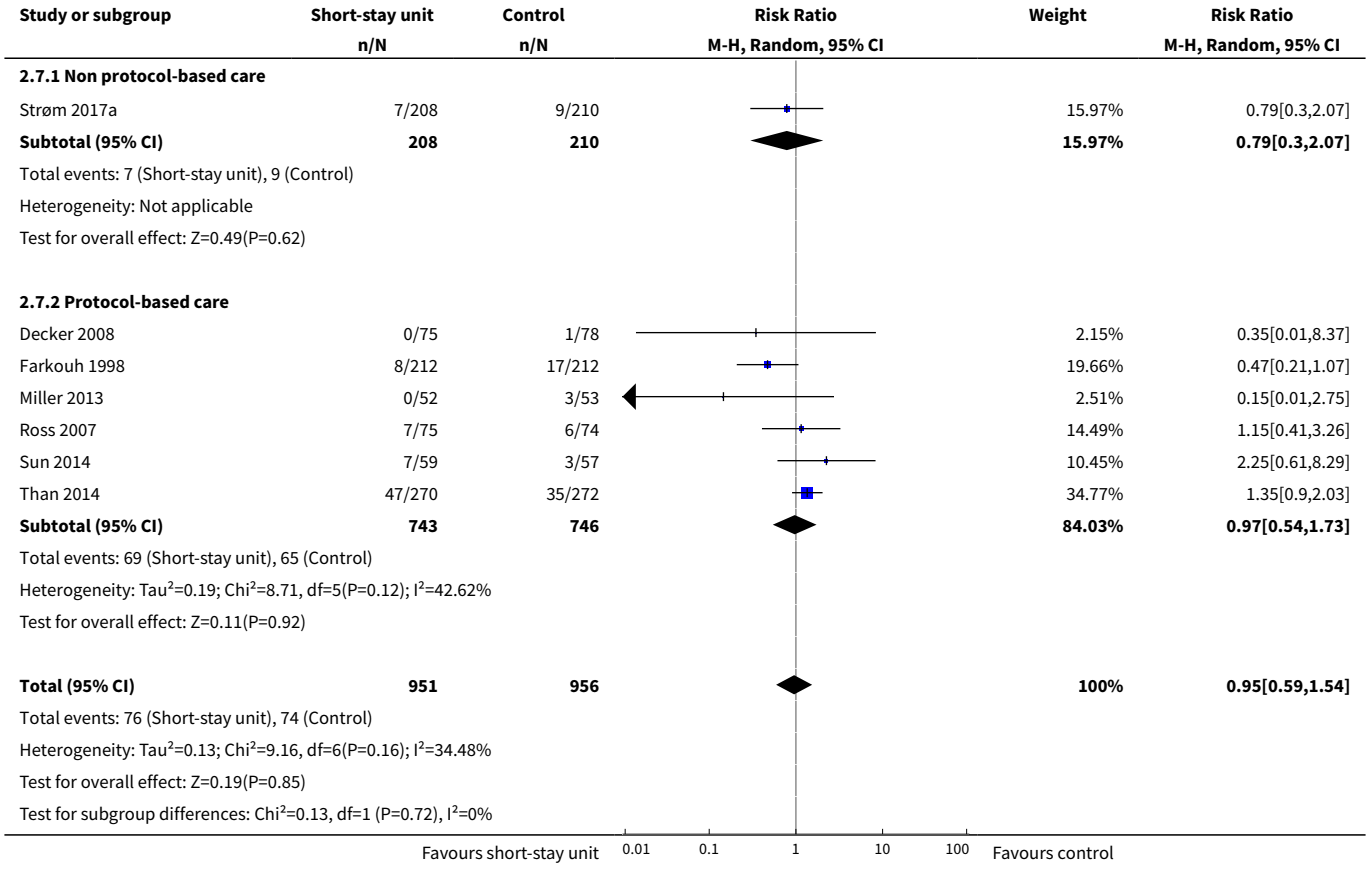
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		2.15%	0.35[0.01,8.37]
Farkouh 1998	8/212	17/212		19.66%	0.47[0.21,1.07]
Miller 2013	0/52	3/53		2.51%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		14.49%	1.15[0.41,3.26]
Strøm 2017a	7/208	9/210		15.97%	0.79[0.3,2.07]
Sun 2014	7/59	3/57		10.45%	2.25[0.61,8.29]
Than 2014	47/270	35/272		34.77%	1.35[0.9,2.03]
Total (95% CI)	**951**	**956**		**100%**	**0.95[0.59,1.54]**
Total events: 76 (Short-stay unit), 74 (Control)					
Heterogeneity: Tau^2=0.13; Chi^2=9.16, df=6(P=0.16); I^2=34.48%					
Test for overall effect: Z=0.19(P=0.85)					

Analysis 2.6. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 6 Serious adverse events at time point closest to 90 days multipurpose unit vs specialised unit.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.6.1 multipurpose unit					
Decker 2008	0/75	1/78		2.15%	0.35[0.01,8.37]
Miller 2013	0/52	3/53		2.51%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		14.49%	1.15[0.41,3.26]
Strøm 2017a	7/208	9/210		15.97%	0.79[0.3,2.07]
Sun 2014	7/59	3/57		10.45%	2.25[0.61,8.29]
Than 2014	47/270	35/272		34.77%	1.35[0.9,2.03]



Analysis 2.7. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 7 Serious adverse events at time point closest to 90-days non-protocol-based vs protocol-based care.



Analysis 2.8. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 8 Serious adverse events at time point closest to 90-days older vs younger participants.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.8.1 Older participants					
Strøm 2017a	7/208	9/210		15.97%	0.79[0.3,2.07]
Subtotal (95% CI)	**208**	**210**		**15.97%**	**0.79[0.3,2.07]**
Total events: 7 (Short-stay unit), 9 (Control)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.49(P=0.62)					
2.8.2 Younger participants					
Decker 2008	0/75	1/78		2.15%	0.35[0.01,8.37]
Farkouh 1998	8/212	17/212		19.66%	0.47[0.21,1.07]
Miller 2013	0/52	3/53		2.51%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		14.49%	1.15[0.41,3.26]
Sun 2014	7/59	3/57		10.45%	2.25[0.61,8.29]
Than 2014	47/270	35/272		34.77%	1.35[0.9,2.03]
Subtotal (95% CI)	**743**	**746**		**84.03%**	**0.97[0.54,1.73]**
Total events: 69 (Short-stay unit), 65 (Control)					
Heterogeneity: Tau^2=0.19; Chi^2=8.71, df=5(P=0.12); I^2=42.62%					
Test for overall effect: Z=0.11(P=0.92)					
Total (95% CI)	**951**	**956**		**100%**	**0.95[0.59,1.54]**
Total events: 76 (Short-stay unit), 74 (Control)					
Heterogeneity: Tau^2=0.13; Chi^2=9.16, df=6(P=0.16); I^2=34.48%					
Test for overall effect: Z=0.19(P=0.85)					
Test for subgroup differences: Chi^2=0.13, df=1 (P=0.72), I^2=0%					

Analysis 2.9. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 9 Serious adverse events at maximum follow-up.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		0.57%	0.35[0.01,8.37]
Farkouh 1998	44/204	41/203		40.71%	1.07[0.73,1.56]
Miller 2010	3/52	5/57		3.06%	0.66[0.17,2.62]
Miller 2013	0/52	3/53		0.68%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		5.37%	1.15[0.41,3.26]
Strøm 2017a	7/208	9/210		6.21%	0.79[0.3,2.07]
Sun 2014	9/53	8/52		7.67%	1.1[0.46,2.64]
Than 2014	47/270	35/272		35.74%	1.35[0.9,2.03]
Total (95% CI)	**989**	**999**		**100%**	**1.11[0.87,1.41]**
Total events: 117 (Short-stay unit), 108 (Control)					
Heterogeneity: Tau^2=0; Chi^2=4.38, df=7(P=0.73); I^2=0%					
Test for overall effect: Z=0.84(P=0.4)					

Analysis 2.10. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 10 Serious adverse events multipurpose unit at maximum follow-up best-worst case scenario.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		1.05%	0.35[0.01,8.37]
Farkouh 1998	44/212	50/212		30.74%	0.88[0.62,1.26]
Miller 2010	3/53	5/57		5.1%	0.65[0.16,2.57]
Miller 2013	0/52	3/53		1.23%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		8.3%	1.15[0.41,3.26]
Strøm 2017a	7/215	14/215		10.74%	0.5[0.21,1.21]
Sun 2014	9/62	18/62		14.66%	0.5[0.24,1.03]
Than 2014	47/271	36/273		28.17%	1.32[0.88,1.96]
Total (95% CI)	**1015**	**1024**		**100%**	**0.83[0.6,1.16]**
Total events: 117 (Short-stay unit), 133 (Control)					
Heterogeneity: Tau^2=0.06; Chi^2=10.01, df=7(P=0.19); I^2=30.06%					
Test for overall effect: Z=1.09(P=0.28)					

Favours short-stay unit — Favours control

Analysis 2.11. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 11 Serious adverse events multipurpose unit at maximum follow-up worst-best case scenario.

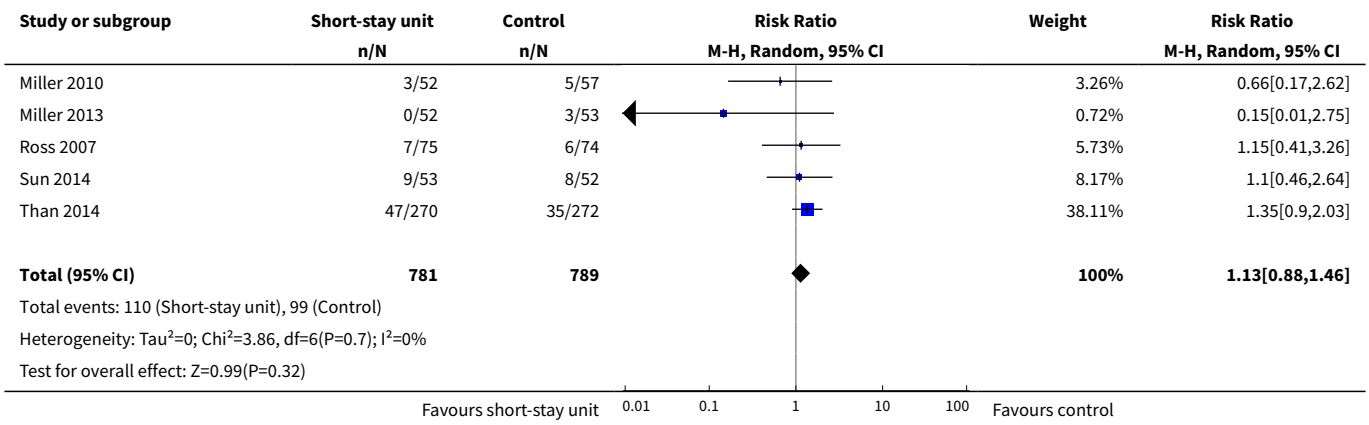
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		0.52%	0.35[0.01,8.37]
Farkouh 1998	52/212	41/212		40.44%	1.27[0.88,1.82]
Miller 2010	4/53	5/57		3.34%	0.86[0.24,3.03]
Miller 2013	0/52	3/53		0.61%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		4.89%	1.15[0.41,3.26]
Strøm 2017a	14/215	9/215		7.98%	1.56[0.69,3.52]
Sun 2014	18/62	8/62		9.32%	2.25[1.06,4.79]
Than 2014	48/271	35/273		32.88%	1.38[0.92,2.06]
Total (95% CI)	**1015**	**1024**		**100%**	**1.35[1.07,1.7]**
Total events: 143 (Short-stay unit), 108 (Control)					
Heterogeneity: Tau^2=0; Chi^2=5.5, df=7(P=0.6); I^2=0%					
Test for overall effect: Z=2.53(P=0.01)					

Favours short-stay unit — Favours control

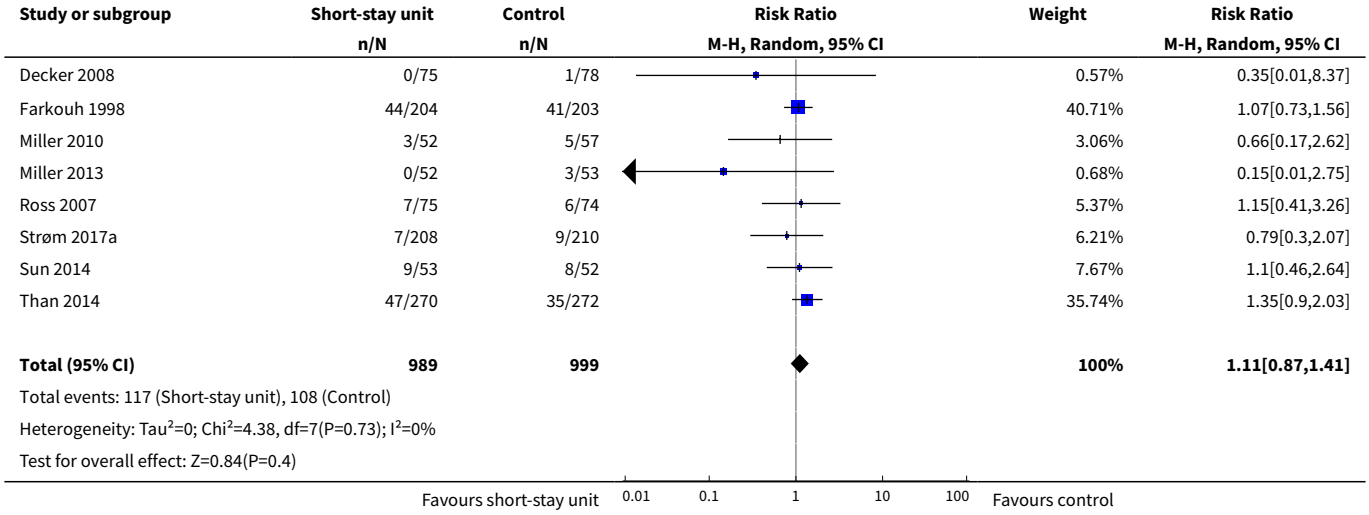
Analysis 2.12. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 12 Serious adverse events multipurpose unit at maximum follow-up published trials.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		0.61%	0.35[0.01,8.37]
Farkouh 1998	44/204	41/203		43.4%	1.07[0.73,1.56]

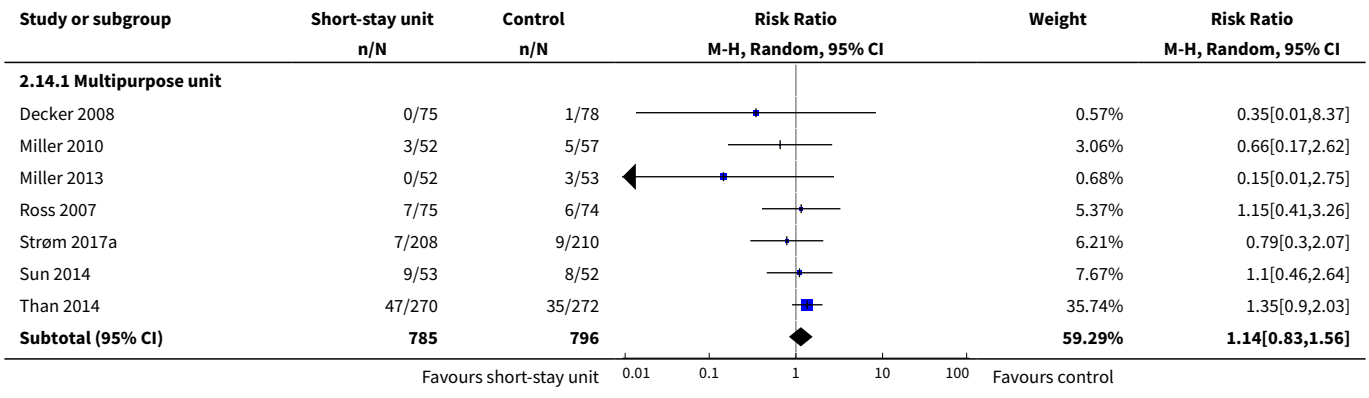
Favours short-stay unit — Favours control

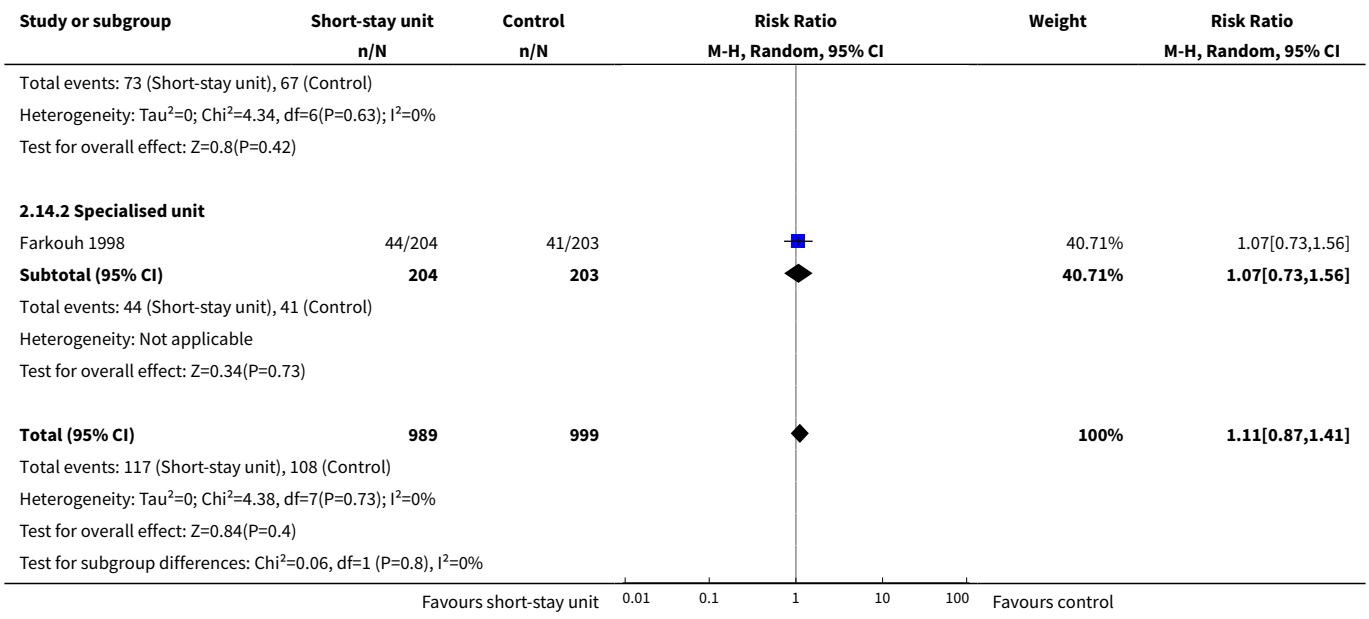


Analysis 2.13. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 13 Serious adverse events multipurpose unit at maximum follow-up and outcome assessed within 6 months of randomisation.

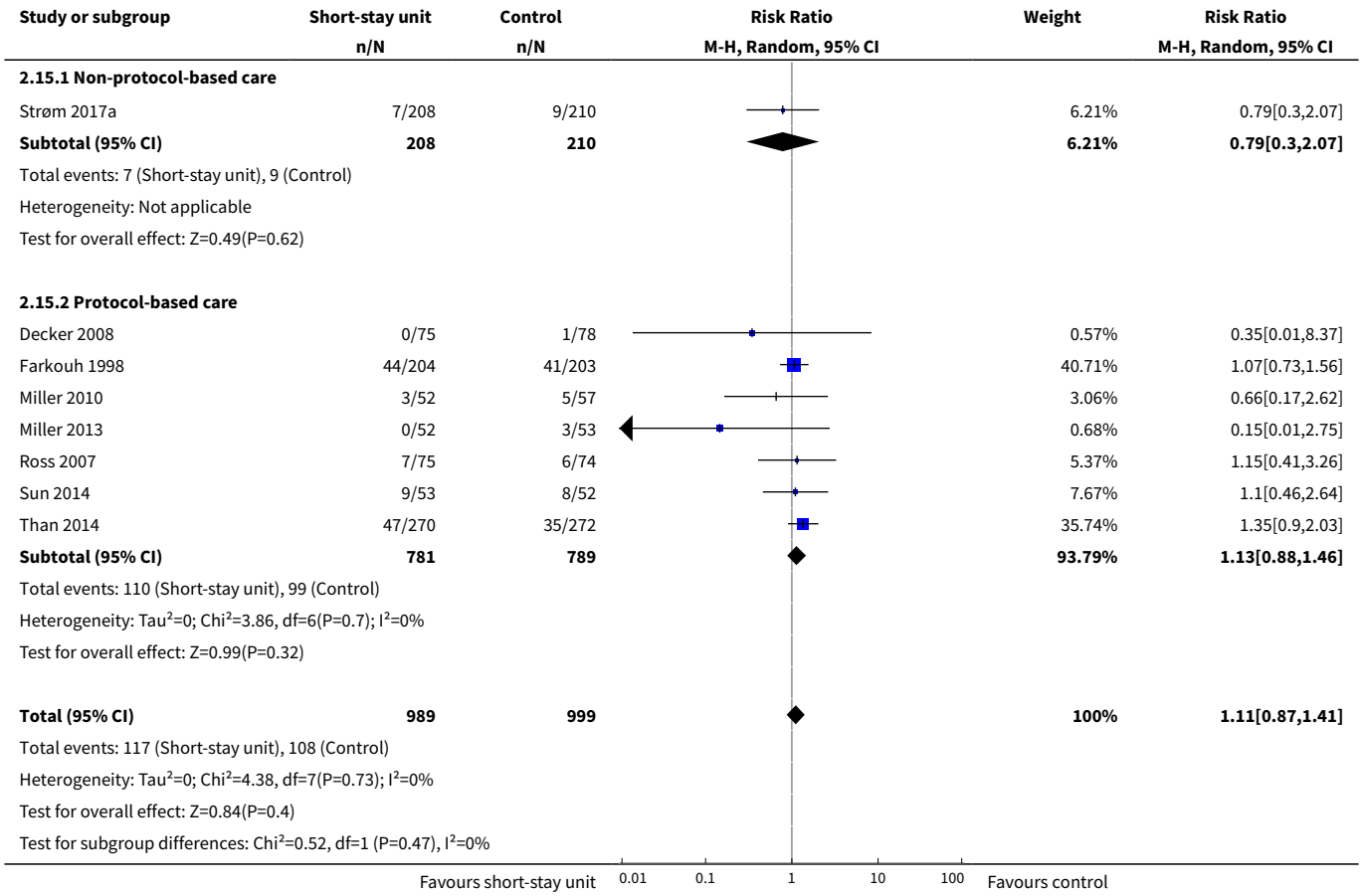


Analysis 2.14. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 14 Serious adverse events at maximum follow-up multipurpose unit vs specialised unit.



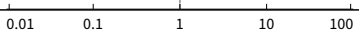


Analysis 2.15. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 15 Serious adverse events at maximum follow-up non-protocol-based vs protocol-based care.



Analysis 2.16. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 16 Serious adverse events at maximum follow-up older participants vs younger participants.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.16.1 Older participants					
Strøm 2017a	7/208	9/210		6.21%	0.79[0.3,2.07]
Subtotal (95% CI)	**208**	**210**		**6.21%**	**0.79[0.3,2.07]**
Total events: 7 (Short-stay unit), 9 (Control)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.49(P=0.62)					
2.16.2 Younger participants					
Decker 2008	0/75	1/78		0.57%	0.35[0.01,8.37]
Farkouh 1998	44/204	41/203		40.71%	1.07[0.73,1.56]
Miller 2010	3/52	5/57		3.06%	0.66[0.17,2.62]
Miller 2013	0/52	3/53		0.68%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		5.37%	1.15[0.41,3.26]
Sun 2014	9/53	8/52		7.67%	1.1[0.46,2.64]
Than 2014	47/270	35/272		35.74%	1.35[0.9,2.03]
Subtotal (95% CI)	**781**	**789**		**93.79%**	**1.13[0.88,1.46]**
Total events: 110 (Short-stay unit), 99 (Control)					
Heterogeneity: Tau^2=0; Chi^2=3.86, df=6(P=0.7); I^2=0%					
Test for overall effect: Z=0.99(P=0.32)					
Total (95% CI)	**989**	**999**		**100%**	**1.11[0.87,1.41]**
Total events: 117 (Short-stay unit), 108 (Control)					
Heterogeneity: Tau^2=0; Chi^2=4.38, df=7(P=0.73); I^2=0%					
Test for overall effect: Z=0.84(P=0.4)					
Test for subgroup differences: Chi^2=0.52, df=1 (P=0.47), I^2=0%					



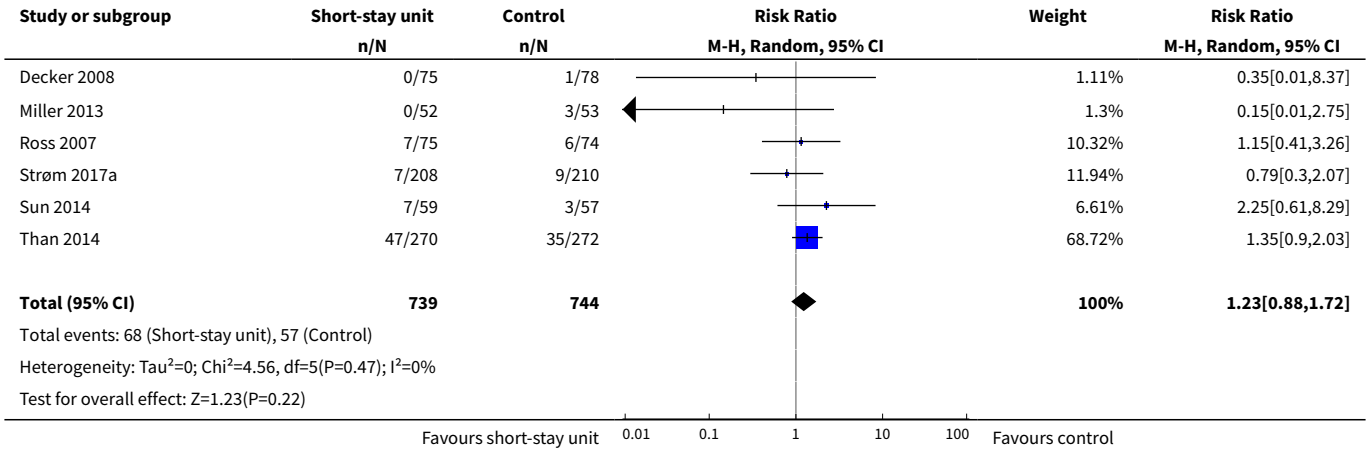
Favours short-stay unit — Favours control

Analysis 2.17. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 17 Serious adverse events at time point closest to 90 days.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	0/75	1/78		2.15%	0.35[0.01,8.37]
Farkouh 1998	8/212	17/212		19.66%	0.47[0.21,1.07]
Miller 2013	0/52	3/53		2.51%	0.15[0.01,2.75]
Ross 2007	7/75	6/74		14.49%	1.15[0.41,3.26]
Strøm 2017a	7/208	9/210		15.97%	0.79[0.3,2.07]
Sun 2014	7/59	3/57		10.45%	2.25[0.61,8.29]
Than 2014	47/270	35/272		34.77%	1.35[0.9,2.03]
Total (95% CI)	**951**	**956**		**100%**	**0.95[0.59,1.54]**
Total events: 76 (Short-stay unit), 74 (Control)					
Heterogeneity: Tau^2=0.13; Chi^2=9.16, df=6(P=0.16); I^2=34.48%					
Test for overall effect: Z=0.19(P=0.85)					

Favours short-stay unit — Favours control

Analysis 2.18. Comparison 2 Serious adverse events in participants treated in short-stay unit vs usual care, Outcome 18 Serious adverse events at time point closest to 90 days w/o Farkouh 1998.



Comparison 3. Hospital readmissions in participants treated in short-stay unit vs usual care

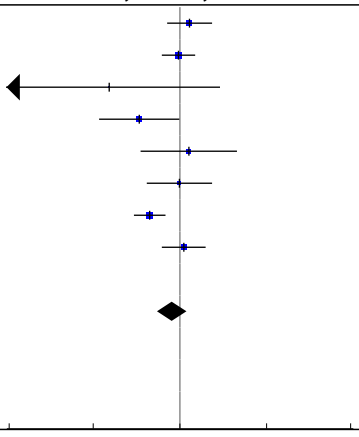
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Hospital readmissions at the time point closest to 90 days	8	1753	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.54, 1.19]
2 Hospital readmissions at the time point closest to 90 days best-worst case scenario	8	1795	Risk Ratio (M-H, Random, 95% CI)	0.72 [0.48, 1.09]
3 Hospital readmissions at the time point closest to 90 days worst-best case scenario	8	1795	Risk Ratio (M-H, Random, 95% CI)	0.93 [0.67, 1.29]
4 Hospital readmissions at the time point closest to 90 days published trials	6	1224	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.65, 1.27]
5 Hospital readmissions at the time point closest to 90 days outcome assessed within 6 months of randomisation	8	1753	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.54, 1.19]
6 Hospital readmissions at the time point closest to 90 days multipurpose units vs specialised units	8	1753	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.54, 1.19]
6.1 Multipurpose units	7	1588	Risk Ratio (M-H, Random, 95% CI)	0.78 [0.51, 1.18]
6.2 Specialised units	1	165	Risk Ratio (M-H, Random, 95% CI)	1.27 [0.35, 4.55]
7 Hospital readmissions at the time point closest to 90 days non-protocol-based vs protocol-based care	8	1753	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.54, 1.19]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
7.1 Non-protocol-based care	2	529	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.26, 2.11]
7.2 Protocol-based care	6	1224	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.65, 1.27]
8 Hospital readmissions at the time point closest to 90 days older vs younger participants	8	1753	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.54, 1.19]
8.1 Older participants	2	529	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.26, 2.11]
8.2 Younger participants	6	1224	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.65, 1.27]
9 Hospital readmissions at the time point maximum follow-up	8	1731	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.51, 1.10]
10 Hospital readmissions at the time point maximum follow-up best-worst case scenario	8	1795	Risk Ratio (M-H, Random, 95% CI)	0.65 [0.45, 0.94]
11 Hospital readmissions at the time point maximum follow-up worst-best case scenario	8	1795	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.59, 1.33]
12 Hospital readmissions at the time point maximum follow-up published trials	6	1223	Risk Ratio (M-H, Random, 95% CI)	0.77 [0.50, 1.18]
13 Hospital readmissions at the time point maximum follow-up outcome assessed within 6 months of randomisation	8	1731	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.51, 1.10]
14 Hospital readmissions at the time point maximum follow-up multipurpose units vs specialised units	8	1731	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.51, 1.10]
14.1 Multipurpose units	7	1566	Risk Ratio (M-H, Random, 95% CI)	0.72 [0.48, 1.08]
14.2 Specialised units	1	165	Risk Ratio (M-H, Random, 95% CI)	1.27 [0.35, 4.55]
15 Hospital readmissions at the time point maximum follow-up non-protocol-based vs protocol-based care	8	1731	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.51, 1.10]
15.1 Non-protocol-based care	2	508	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.27, 1.94]
15.2 Protocol-based care	6	1223	Risk Ratio (M-H, Random, 95% CI)	0.77 [0.50, 1.18]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
16 Hospital readmissions at the time point maximum follow-up older vs younger participants	8	1731	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.51, 1.10]
16.1 Older participants	2	508	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.27, 1.94]
16.2 Younger participants	6	1223	Risk Ratio (M-H, Random, 95% CI)	0.77 [0.50, 1.18]
17 Hospital readmissions at the time point closest to 90 days w/o Strøm 2017a	7	1351	Risk Ratio (M-H, Random, 95% CI)	0.98 [0.73, 1.31]
18 Hospital readmissions at the time point maximum follow-up w/o Strøm 2017a	7	1329	Risk Ratio (M-H, Random, 95% CI)	0.85 [0.59, 1.22]
19 Hospital readmissions at the time point maximum follow-up w/o Strøm 2017a and Miller 2010	6	1220	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.79, 1.30]

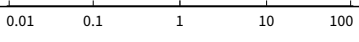
Analysis 3.1. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 1 Hospital readmissions at the time point closest to 90 days.

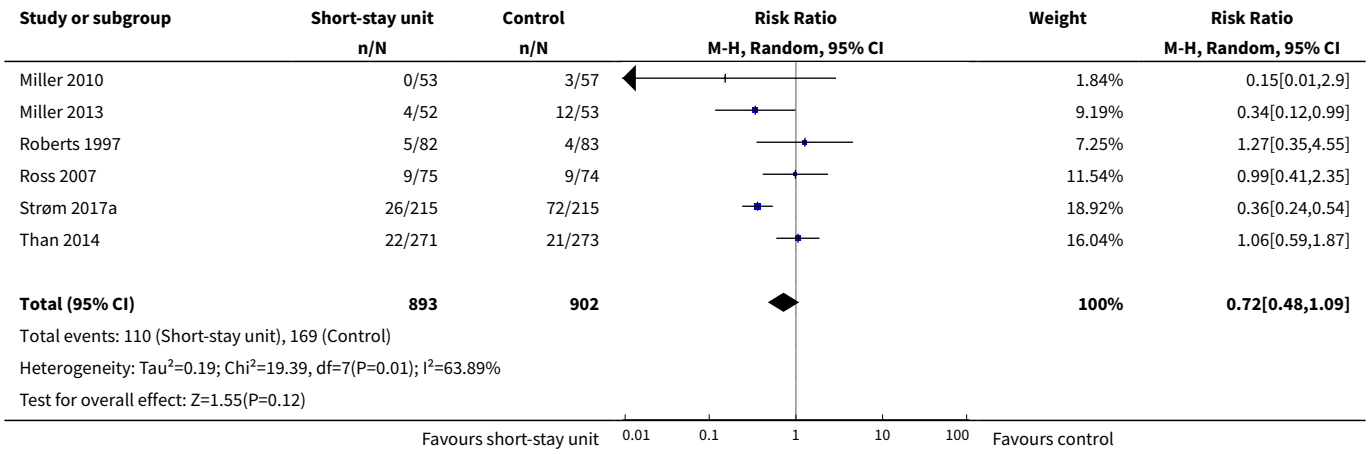
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	19/65	14/62		16.03%	1.29[0.71,2.35]
Decker 2008	25/75	27/78		19.28%	0.96[0.62,1.5]
Miller 2010	0/53	3/57		1.65%	0.15[0.01,2.9]
Miller 2013	4/52	12/53		8.81%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		6.83%	1.27[0.35,4.55]
Ross 2007	9/75	9/74		11.32%	0.99[0.41,2.35]
Strøm 2017a	26/201	58/201		19.77%	0.45[0.29,0.68]
Than 2014	22/270	20/272		16.32%	1.11[0.62,1.98]
Total (95% CI)	**873**	**880**		**100%**	**0.8[0.54,1.19]**
Total events: 110 (Short-stay unit), 147 (Control)					
Heterogeneity: Tau^2=0.15; Chi^2=16.22, df=7(P=0.02); I^2=56.83%					
Test for overall effect: Z=1.1(P=0.27)					



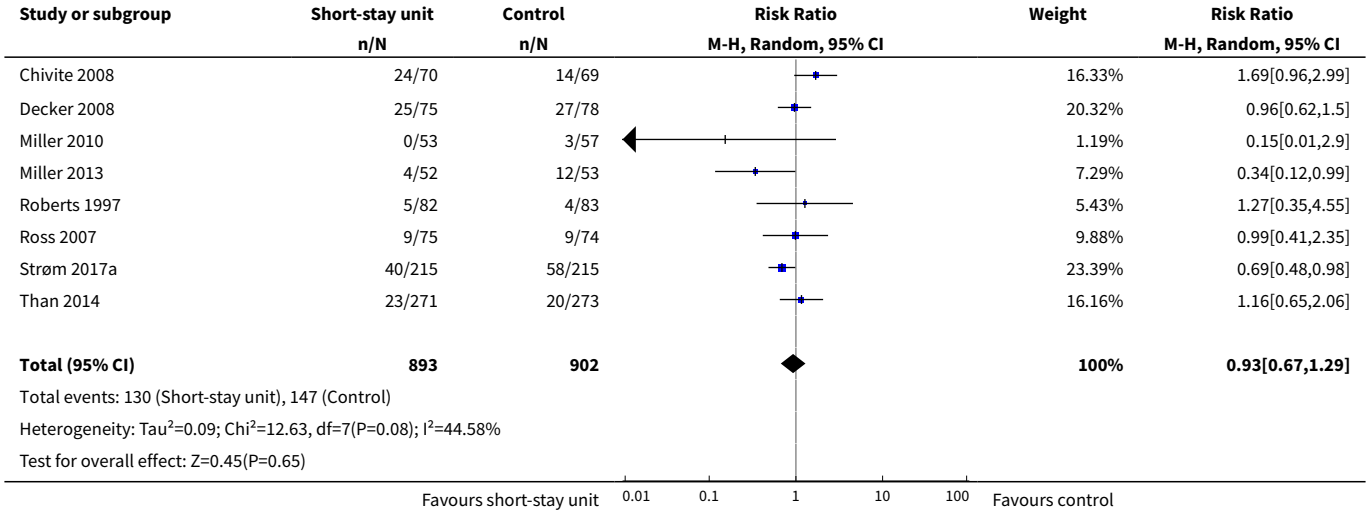
Analysis 3.2. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 2 Hospital readmissions at the time point closest to 90 days best-worst case scenario.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	19/70	21/69		16.9%	0.89[0.53,1.51]
Decker 2008	25/75	27/78		18.32%	0.96[0.62,1.5]

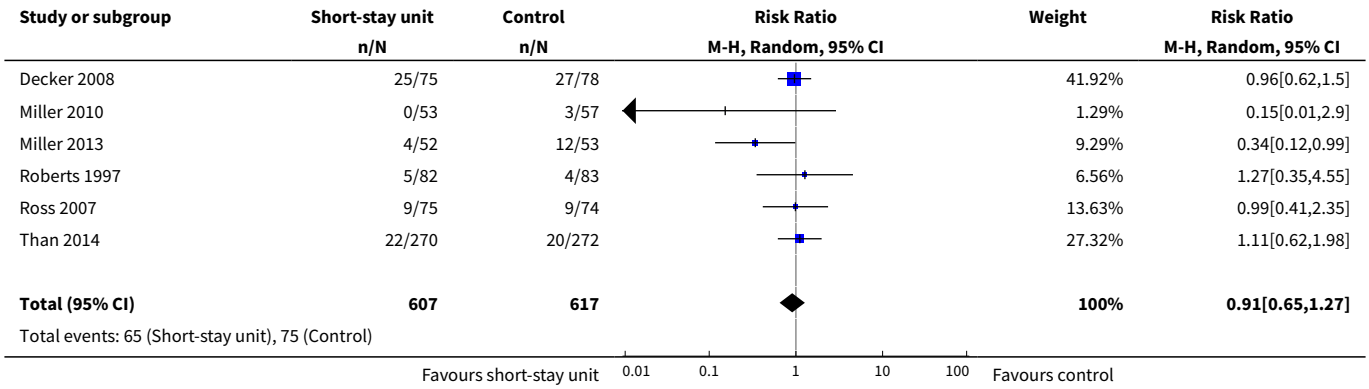


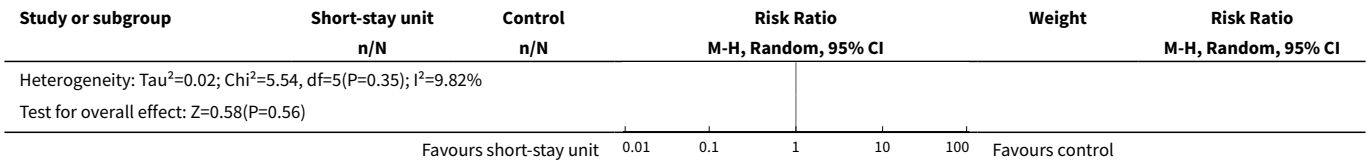


Analysis 3.3. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 3 Hospital readmissions at the time point closest to 90 days worst-best case scenario.

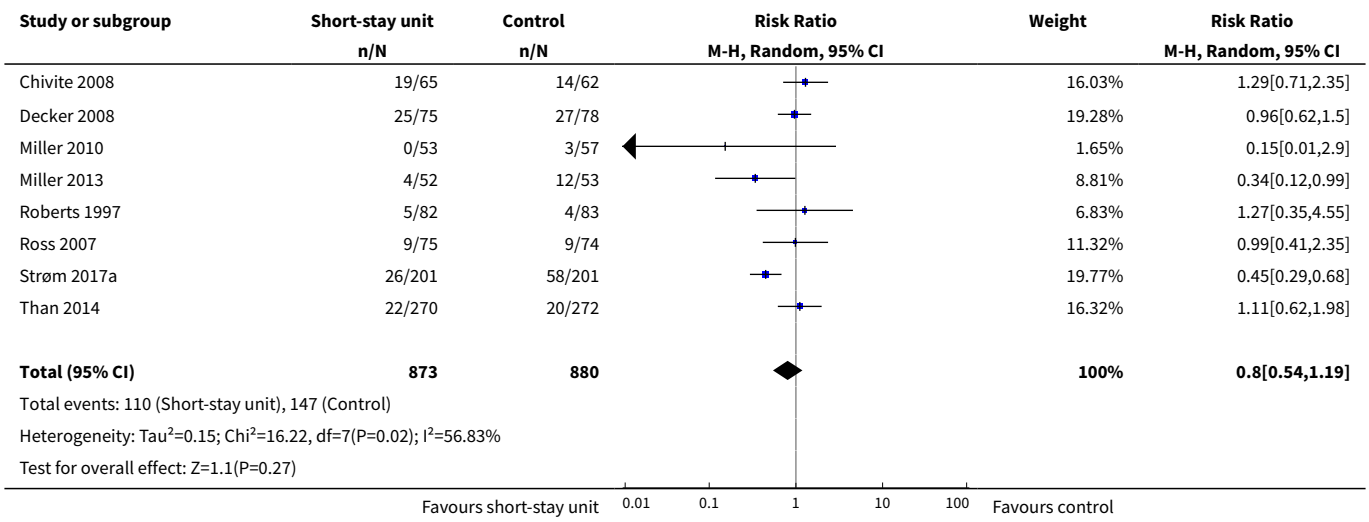


Analysis 3.4. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 4 Hospital readmissions at the time point closest to 90 days published trials.

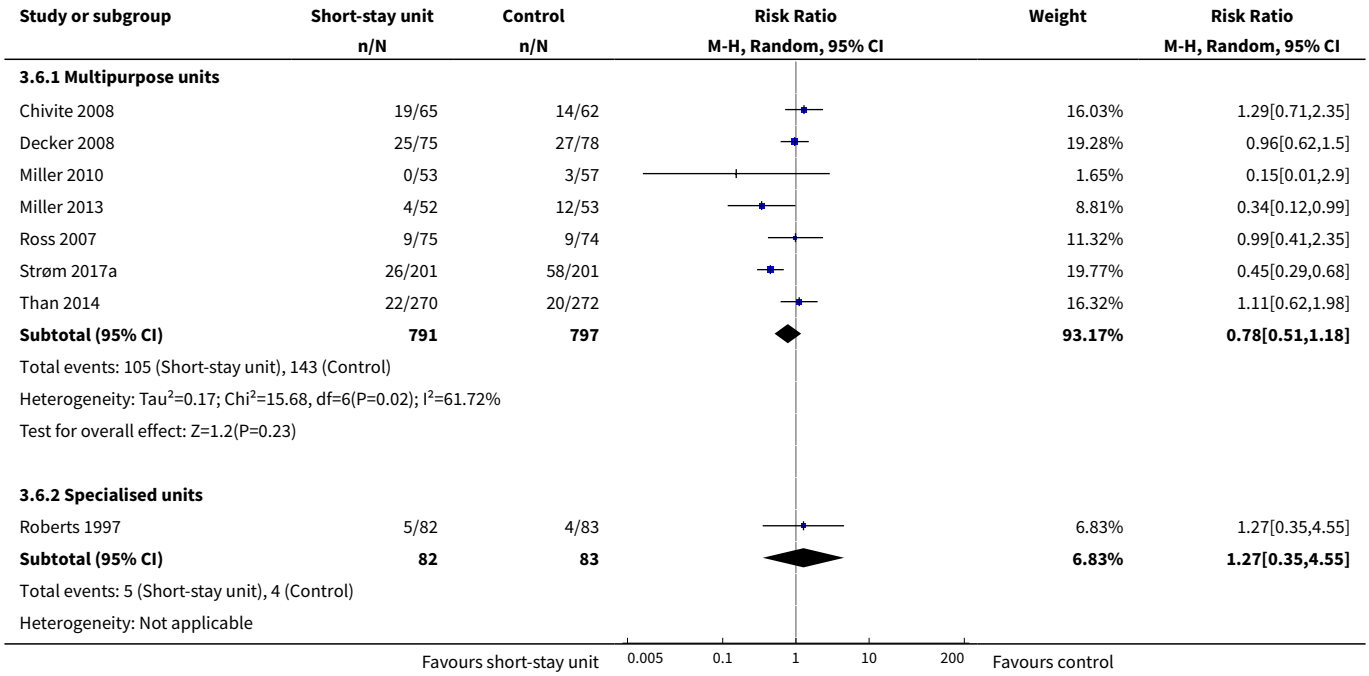


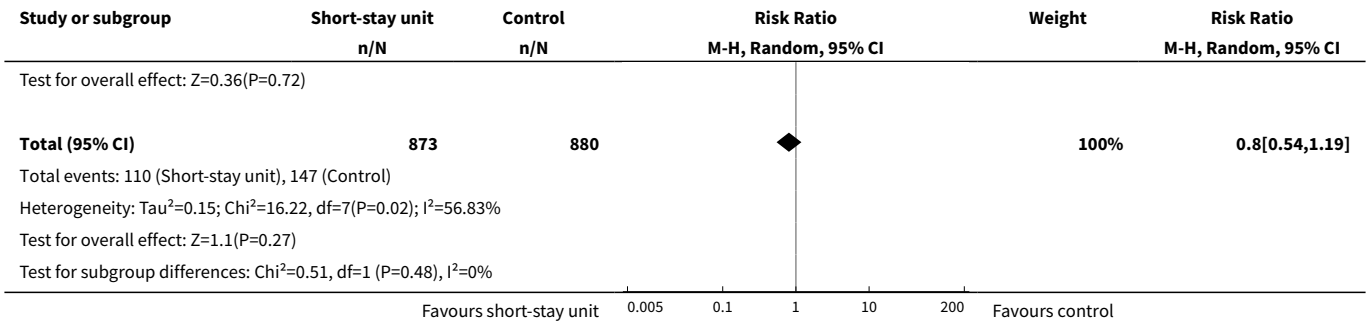


Analysis 3.5. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 5 Hospital readmissions at the time point closest to 90 days outcome assessed within 6 months of randomisation.

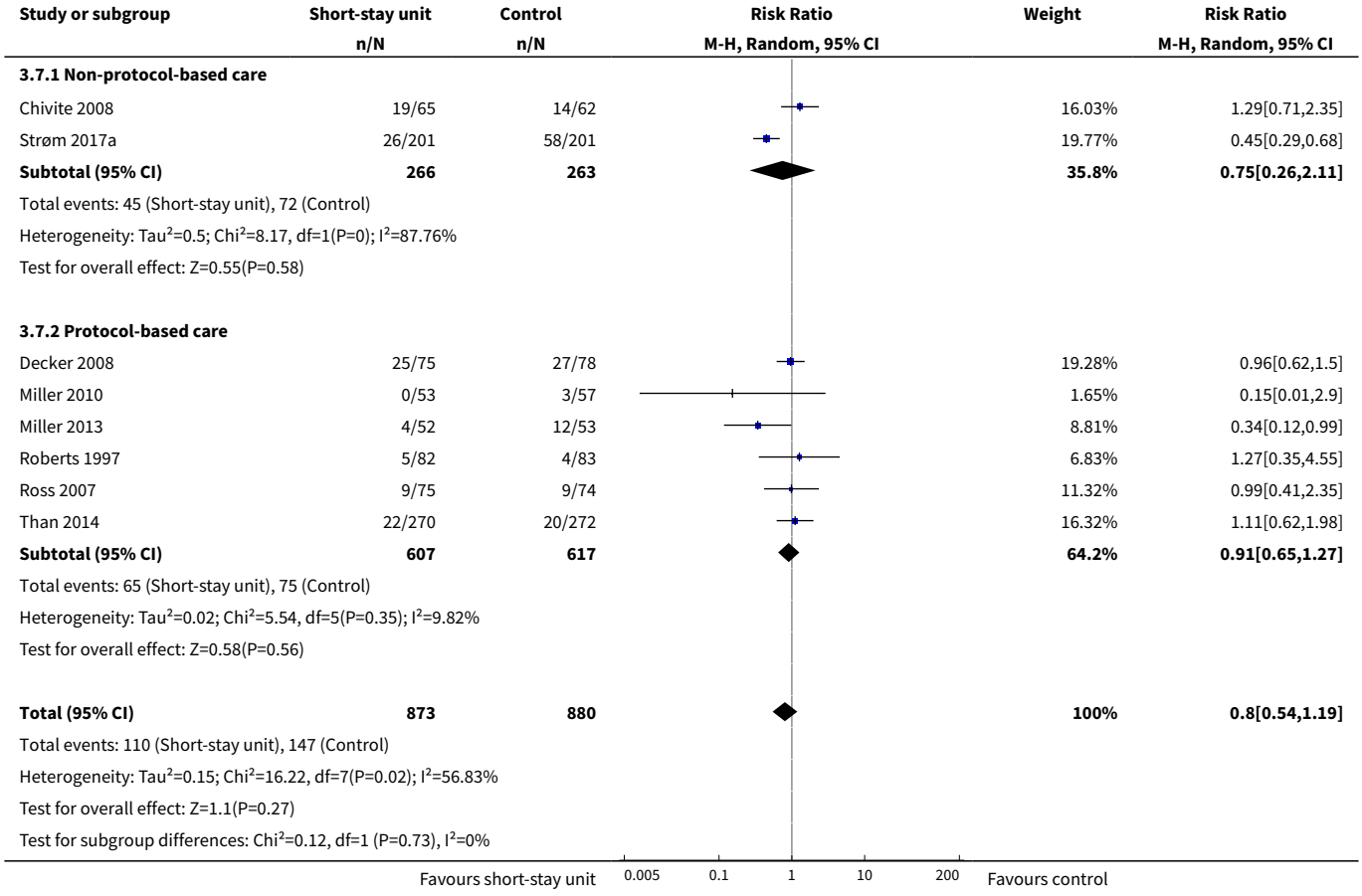


Analysis 3.6. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 6 Hospital readmissions at the time point closest to 90 days multipurpose units vs specialised units.

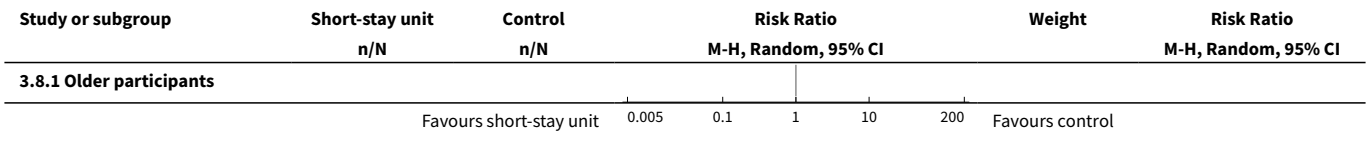


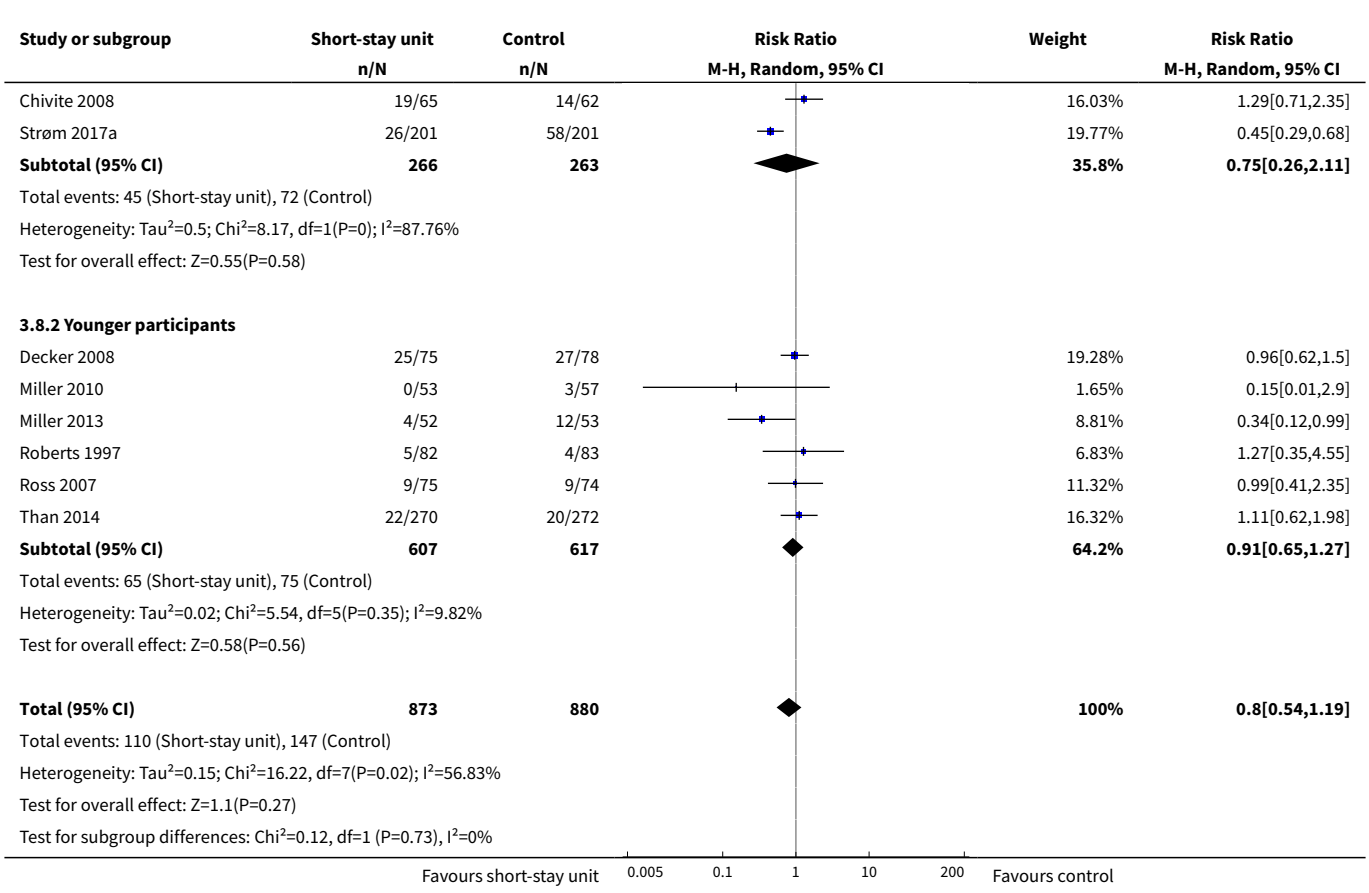


Analysis 3.7. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 7 Hospital readmissions at the time point closest to 90 days non-protocol-based vs protocol-based care.

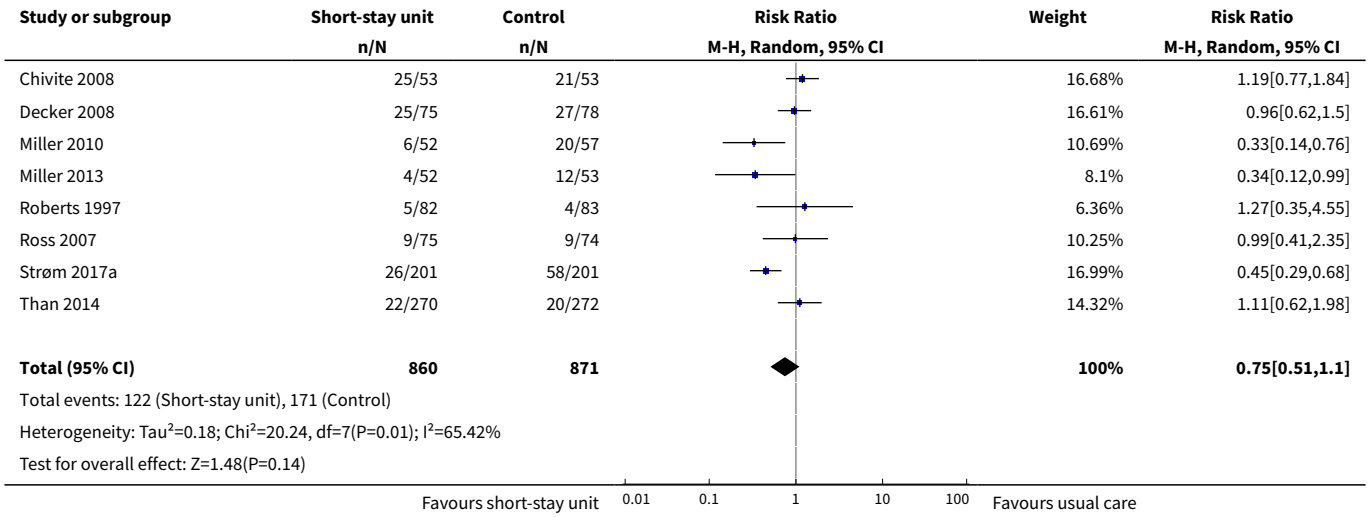


Analysis 3.8. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 8 Hospital readmissions at the time point closest to 90 days older vs younger participants.



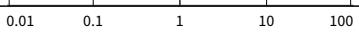


Analysis 3.9. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 9 Hospital readmissions at the time point maximum follow-up.



Analysis 3.10. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 10 Hospital readmissions at the time point maximum follow-up best-worst case scenario.

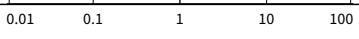
Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	25/70	37/69		17.62%	0.67[0.45,0.98]
Decker 2008	25/75	27/78		16.6%	0.96[0.62,1.5]
Miller 2010	6/53	20/57		10.4%	0.32[0.14,0.74]
Miller 2013	4/52	12/53		7.81%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		6.09%	1.27[0.35,4.55]
Ross 2007	9/75	9/74		9.97%	0.99[0.41,2.35]
Strøm 2017a	26/215	72/215		17.22%	0.36[0.24,0.54]
Than 2014	22/271	21/273		14.3%	1.06[0.59,1.87]
Total (95% CI)	**893**	**902**		**100%**	**0.65[0.45,0.94]**
Total events: 122 (Short-stay unit), 202 (Control)					
Heterogeneity: Tau^2=0.17; Chi^2=20.03, df=7(P=0.01); I^2=65.05%					
Test for overall effect: Z=2.29(P=0.02)					



Favours short-stay unit — Favours control

Analysis 3.11. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 11 Hospital readmissions at the time point maximum follow-up worst-best case scenario.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	42/70	21/69		16.29%	1.97[1.32,2.96]
Decker 2008	25/75	27/78		15.81%	0.96[0.62,1.5]
Miller 2010	7/53	20/57		11.45%	0.38[0.17,0.82]
Miller 2013	4/52	12/53		8.4%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		6.72%	1.27[0.35,4.55]
Ross 2007	9/75	9/74		10.39%	0.99[0.41,2.35]
Strøm 2017a	40/215	58/215		16.9%	0.69[0.48,0.98]
Than 2014	23/271	20/273		14.03%	1.16[0.65,2.06]
Total (95% CI)	**893**	**902**		**100%**	**0.88[0.59,1.33]**
Total events: 155 (Short-stay unit), 171 (Control)					
Heterogeneity: Tau^2=0.23; Chi^2=25.57, df=7(P=0); I^2=72.62%					
Test for overall effect: Z=0.6(P=0.55)					

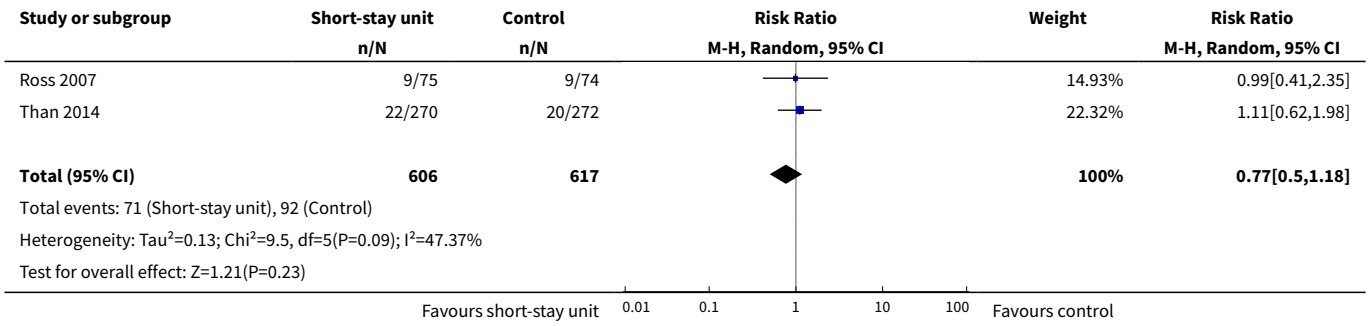


Favours short-stay unit — Favours control

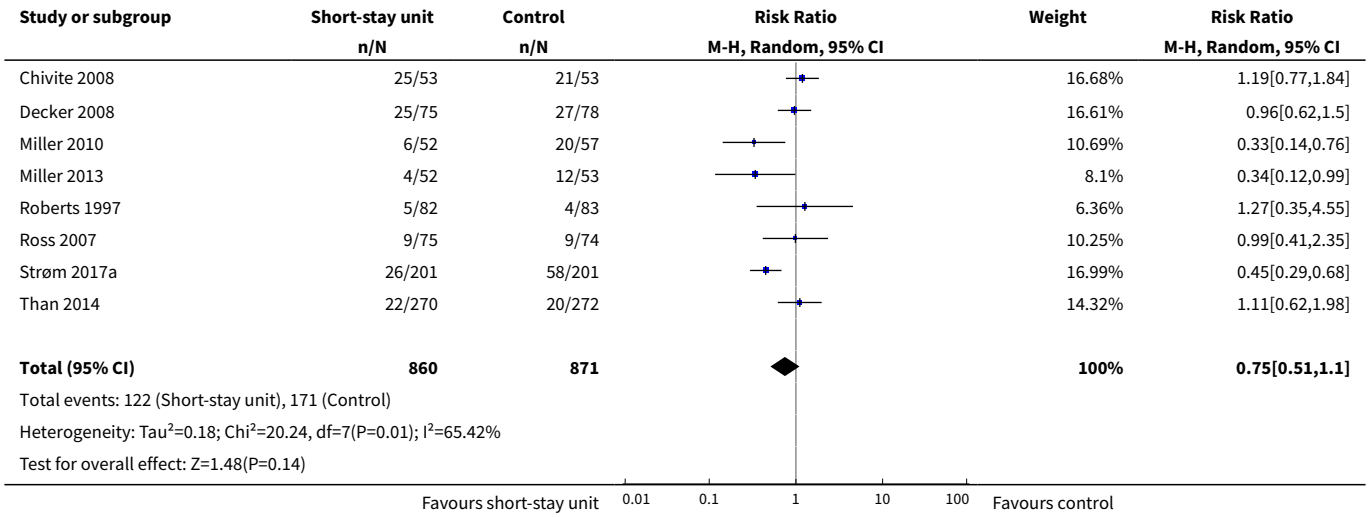
Analysis 3.12. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 12 Hospital readmissions at the time point maximum follow-up published trials.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Decker 2008	25/75	27/78		26.94%	0.96[0.62,1.5]
Miller 2010	6/52	20/57		15.68%	0.33[0.14,0.76]
Miller 2013	4/52	12/53		11.41%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		8.72%	1.27[0.35,4.55]

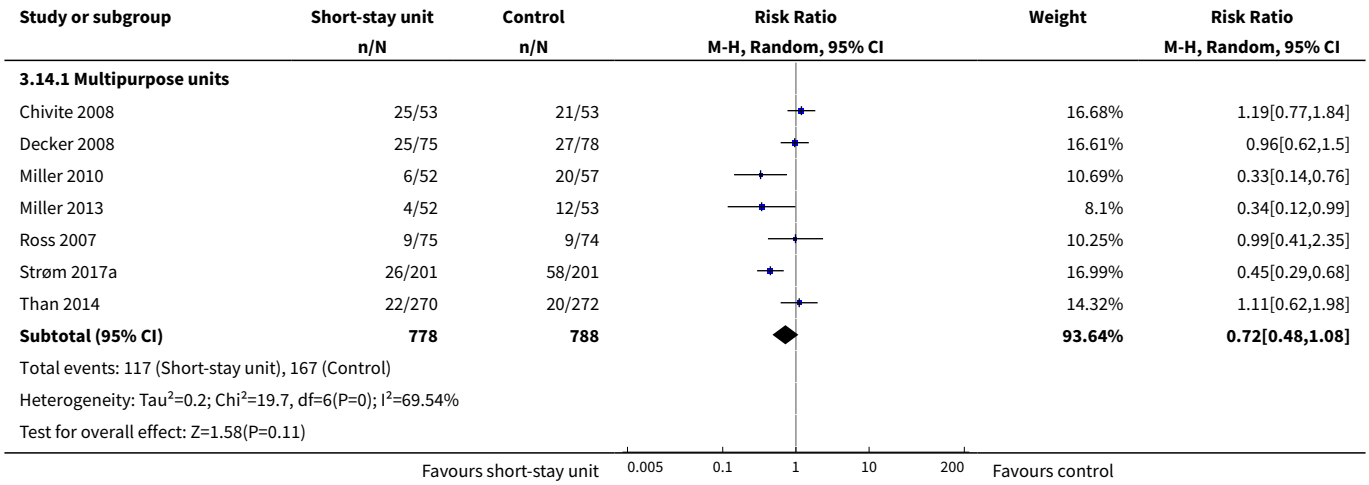
Favours short-stay unit — Favours control

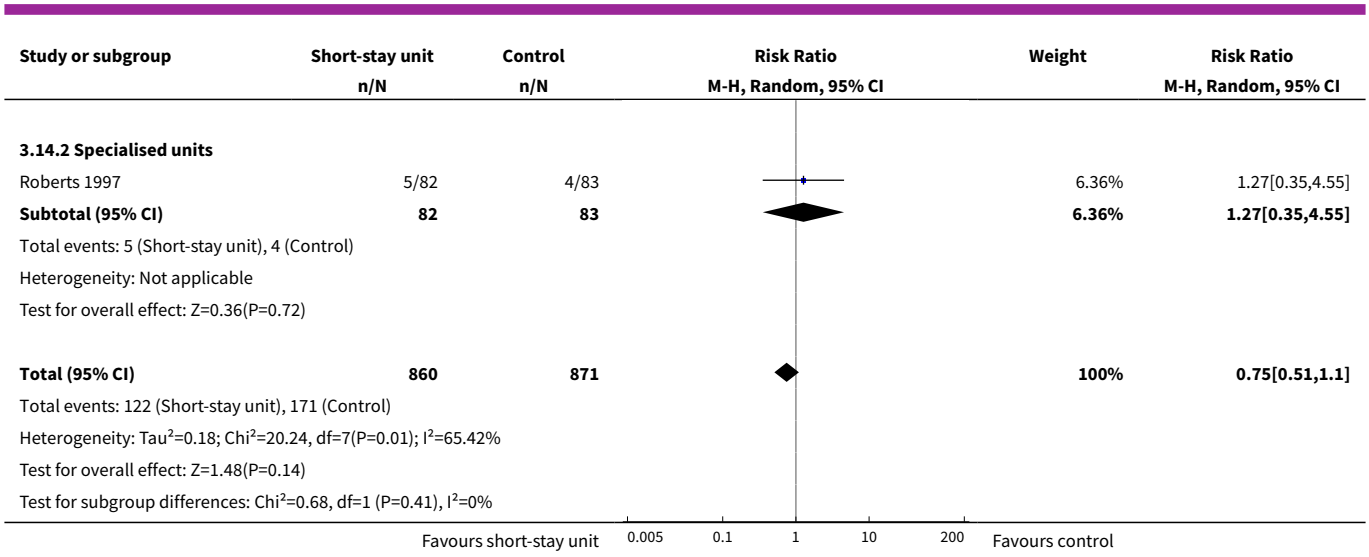


Analysis 3.13. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 13 Hospital readmissions at the time point maximum follow-up outcome assessed within 6 months of randomisation.

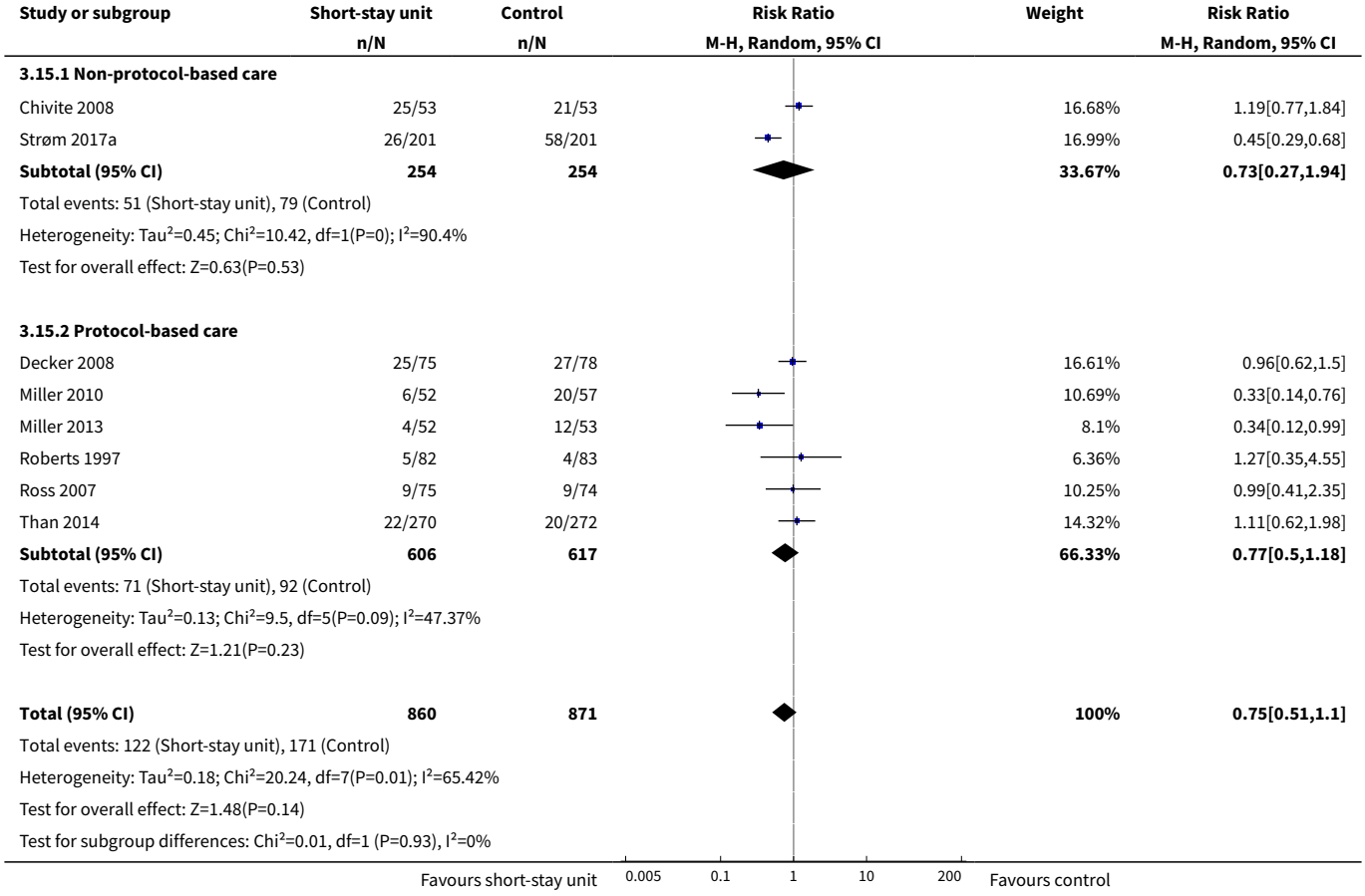


Analysis 3.14. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 14 Hospital readmissions at the time point maximum follow-up multipurpose units vs specialised units.





Analysis 3.15. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 15 Hospital readmissions at the time point maximum follow-up non-protocol-based vs protocol-based care.



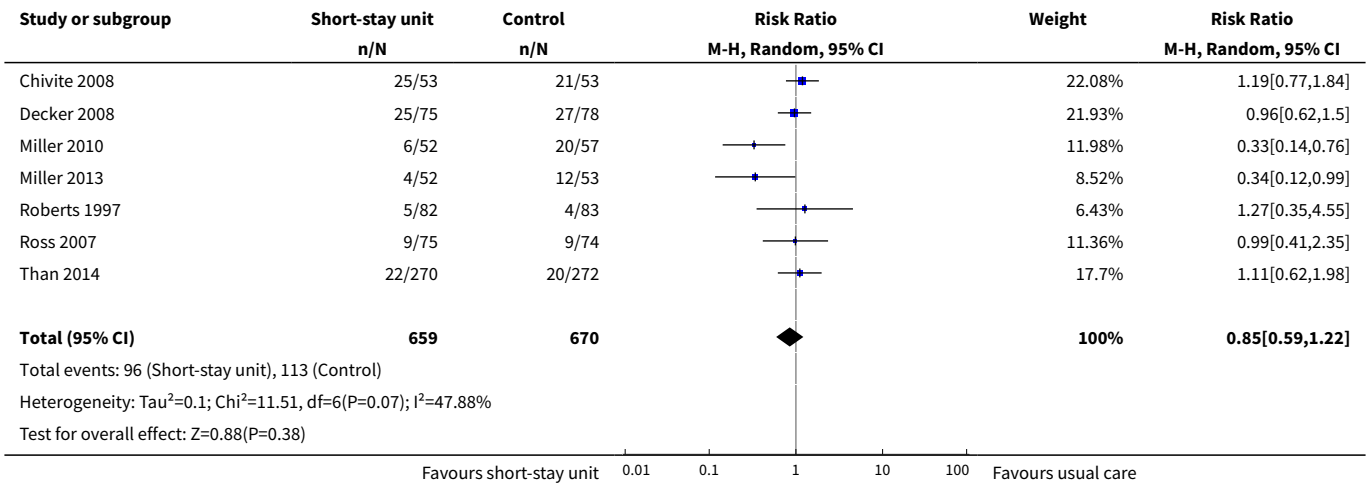
Analysis 3.16. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 16 Hospital readmissions at the time point maximum follow-up older vs younger participants.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
3.16.1 Older participants					
Chivite 2008	25/53	21/53		16.68%	1.19[0.77,1.84]
Strøm 2017a	26/201	58/201		16.99%	0.45[0.29,0.68]
Subtotal (95% CI)	**254**	**254**		**33.67%**	**0.73[0.27,1.94]**
Total events: 51 (Short-stay unit), 79 (Control)					
Heterogeneity: Tau^2=0.45; Chi^2=10.42, df=1(P=0); I^2=90.4%					
Test for overall effect: Z=0.63(P=0.53)					
3.16.2 Younger participants					
Decker 2008	25/75	27/78		16.61%	0.96[0.62,1.5]
Miller 2010	6/52	20/57		10.69%	0.33[0.14,0.76]
Miller 2013	4/52	12/53		8.1%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		6.36%	1.27[0.35,4.55]
Ross 2007	9/75	9/74		10.25%	0.99[0.41,2.35]
Than 2014	22/270	20/272		14.32%	1.11[0.62,1.98]
Subtotal (95% CI)	**606**	**617**		**66.33%**	**0.77[0.5,1.18]**
Total events: 71 (Short-stay unit), 92 (Control)					
Heterogeneity: Tau^2=0.13; Chi^2=9.5, df=5(P=0.09); I^2=47.37%					
Test for overall effect: Z=1.21(P=0.23)					
Total (95% CI)	**860**	**871**		**100%**	**0.75[0.51,1.1]**
Total events: 122 (Short-stay unit), 171 (Control)					
Heterogeneity: Tau^2=0.18; Chi^2=20.24, df=7(P=0.01); I^2=65.42%					
Test for overall effect: Z=1.48(P=0.14)					
Test for subgroup differences: Chi^2=0.01, df=1 (P=0.93), I^2=0%					

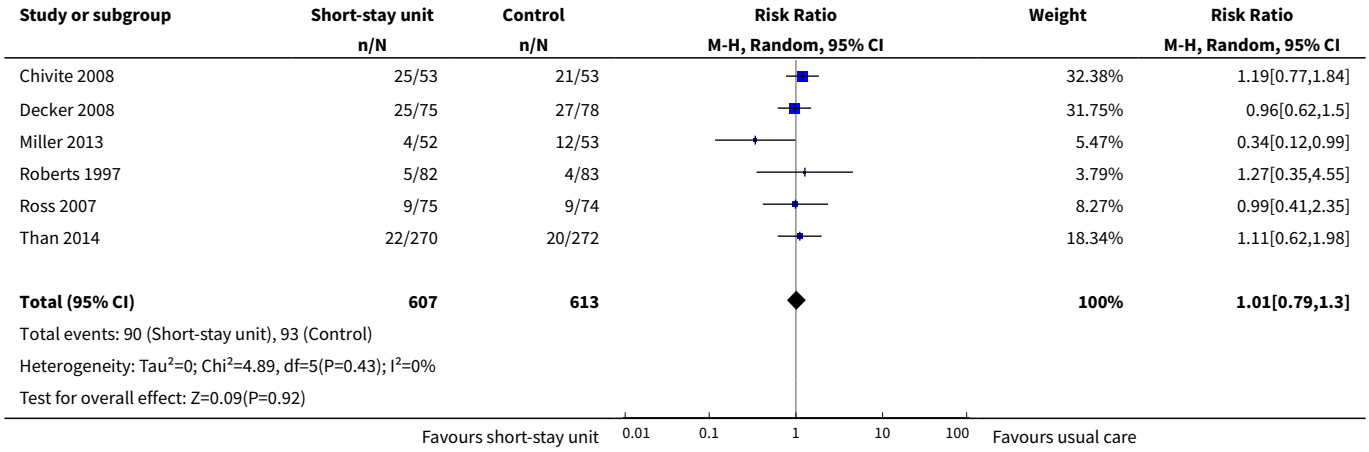
Analysis 3.17. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 17 Hospital readmissions at the time point closest to 90 days w/o Strøm 2017a.

Study or subgroup	Short-stay unit n/N	Control n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Chivite 2008	19/65	14/62		20.71%	1.29[0.71,2.35]
Decker 2008	25/75	27/78		34.02%	0.96[0.62,1.5]
Miller 2010	0/53	3/57		0.97%	0.15[0.01,2.9]
Miller 2013	4/52	12/53		7.13%	0.34[0.12,0.99]
Roberts 1997	5/82	4/83		5.01%	1.27[0.35,4.55]
Ross 2007	9/75	9/74		10.53%	0.99[0.41,2.35]
Than 2014	22/270	20/272		21.62%	1.11[0.62,1.98]
Total (95% CI)	**672**	**679**		**100%**	**0.98[0.73,1.31]**
Total events: 84 (Short-stay unit), 89 (Control)					
Heterogeneity: Tau^2=0.01; Chi^2=6.56, df=6(P=0.36); I^2=8.58%					
Test for overall effect: Z=0.15(P=0.88)					

Analysis 3.18. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 18 Hospital readmissions at the time point maximum follow-up w/o Strøm 2017a.



Analysis 3.19. Comparison 3 Hospital readmissions in participants treated in short-stay unit vs usual care, Outcome 19 Hospital readmissions at the time point maximum follow-up w/o Strøm 2017a and Miller 2010.



ADDITIONAL TABLES

Table 1. Funding sources

Sources of funding for included trials comparing short-stay unit hospitalisation (intervention) with usual care (control) in adult participants with internal medicine diseases and conditions	
Chivite 2008	Unclear
Decker 2008	Funded by a clinical research grant from the Mayo Foundation for Education and Research, USA
Farkouh 1998	Supported in part by grants from Aetna Health Plans (1A1575) and the Mayo Foundation, USA

Table 1. Funding sources *(Continued)*

Gomez 1996	Deseret Foundation, Intermountain Health Care, Salt Lake City, and Genetech Inc South San Fransisco California, USA
McDermott 1997	Supported by grants HHS HS07103 and HHS HS07969 from the Agency for Health Care Policy and Research, Rockville, Md, as well as the Career Development Award from the Emergency Medicine Foundation, Dallas, Texas, USA (Dr Murphy)
Miller 2010	Funded by the Translational Science Institute of Wake Forest University School of Medicine, USA. Dr. Miller had received research support from Biosite, Schering-Plough, Siemens, and Heartscape Technologies Inc; had been a consultant for Molecular Insight and the Medicines Co; and had been a speaker for Sanofi-Aventis (indirect sponsor of a CME event). Dr. Lefebvre had received research support from Heartscape Technologies Inc. A Siemens MRI scanner was used in the trial.
Miller 2013	Funding/support provided by NIH/NHLBI grants 1 R21 HL097131-01A1 (Miller), 1 R01 HL076438 (Hundley). Dr. Miller had received research support from Biosite, Schering-Plough, Siemens, and Heartscape Technologies Inc; had been a consultant for Molecular Insight and the Medicines Co; and had been a speaker for Sanofi-Aventis (indirect sponsor of a CME event). A Siemens MRI scanner was used in the trial.
Roberts 1997	Supported in part by the Agency for Health Care Policy, USA and Research grant R01-HS-07103
Ross 2007	Support from Foundation for Education and Research in Neurological Emergencies, USA and The Emergency Medicine Foundation, USA
Rydman 1997	Supported by grants from U.S. Department of Health & Human Services (HHS HS07103)
Shen 2004	Mayo Foundation, USA and an investigator-initiated research grant from Medtronic Incorporated (Dr Shen). Dr Shen received support from the National Institutes of Health, USA (P50NS 32352 and R01HL 70302), and Dr Jahangir receives support from the National Institute on Aging (AG21201), the American Heart Association (0230133N), and the Mayo Foundation (CR75), all USA
Sun 2014	This trial was supported by National Institutes of Health (NIH) grant RC1 AG035664 (Dr. Sun). At the time of the trial, Dr. Sun was supported by NIH/ NIA grants K12 AG001004, the University of California, Los Angeles Older Americans Independence Centre P30-AG028748, and an American Geriatrics Society Dennis Jahnigen Career Development Award, all USA. Dr. Mangione was supported in part by the UCLA Robert Wood Johnson Clinical Scholars Program and the U.S. Department of Veterans Affairs (Grant #67799), all USA. Dr. Mangione received support from the University of California, Los Angeles, Resource Centres for Minority Aging Research Centre for Health Improvement of Minority Elderly (RCMAR/CHIME) under NIH/NIA Grant P30-AG021684, and from the NIH/NCATS UCLA CTSI Grant Number UL1TR000124, all USA
Strøm 2017a	Dr Strøm received a research grant from the University of Copenhagen, Denmark and Region Zealand, Denmark, and a research grant from Region Zealand Research Foundation, Denmark
Than 2014	Dr Than has received funding from Alere, Abbott, Beckman, and Roche for speaking and support for other research. Dr Goodacre has received funding from the UK National Institute for Health Research for chest pain trials. Dr George has received funding from Abbott, Beckman Coulter, and Roche for speaking. Dr Ardagh has received funding from the Health Research Council, New Zealand (HRCNZ) for unrelated research. Dr Peacock has received research grants from Abbott, Alere, Brahms, Novartis, Roche, and The Medicines Company; had been a consultant for Abbott, Alere, Lily, The Medicines Company; had been a speaker for Bureau Abbott, Alere, and EKjmR; and had ownership interest in Comprehensive Research Associates LLC, Vital Sensors, and Emergencies in Medicine LLC. Dr Deely has received funding from the Emergency Care Foundation, NZ for medical writing and HRCNZ for unrelated research, NZ. Dr Cullen has received funding from Abbott Diagnostics, Roche, Alere, Siemens, and Radiometer Pacific for clinical trials, and from Alere, Boehringer Ingelheim, Pfizer, AstraZenica, Abbott Diagnostics, and Radiometer Pacific for speaking and education. Dr Richards had received speaker honoraria from Roche Dx and Alere

Table 2. Overview of included trials

Characteristics of included trials comparing short-stay unit hospitalisation (intervention) with usual care (control) in adult participants with internal medicine diseases and conditions

Study ID	Number of participants	Setting/country	Reason for admission	Inclusion criteria	Exclusion criteria	Intervention (short-stay unit hospitalisation)	Control (usual care)	Outcomes
Chivite 2008 (Trial only reported in abstract)	139	Single centre/Spain	Heart failure	Older participants (age limit not defined); acute decompensated heart failure; clinical stability; moderate comorbidity; moderate disability	Secondary heart failure diagnosis (defined to be acute coronary syndromes, severe valve disease, pericardial disease, isolated cor pulmonale); estimated survival < 6 months; severe cognitive impairment; severe functional impairment; unstable clinical condition after initial ED management (defined to be hypotension, tachycardia, electrolyte imbalances, acute kidney failure, or need for vasoactive drugs)	Placement in short-stay unit, no further description available in abstract, but trialists informed that the short-stay unit did not provide specified treatment protocols but encouraged early mobilisation (removal of iv lines and urinary catheters, bed rest was discouraged) and early discharge planning (specialist physicians available to implement early discharge, cardiology consultation available Monday-Friday, only basic tests performed)	Hospitalisation in internal medicine services, no further description available	Length of stay in hospital; quality of life; functional status; hospital readmissions; mortality; exercise capacity; quality of care; disease knowledge; self-care abilities; total hospital costs
Decker 2008	153	Single centre/USA	Atrial fibrillation	Age ≥ 18 years; atrial fibrillation of < 48 h duration without haemodynamic instability or other conditions requir-	Atrial fibrillation > 48 h duration; uncertain duration of symptoms; haemodynamic instability; intra-cardiac thrombus; congestive heart failure; class IV angina; recent acute	Placement in ED observation unit and standardised protocol: 8-h protocol including recording of an ECG; chest radiograph; routine laboratory investigations followed by pharmacologic pulse rate control and continuous cardiac monitoring for 6 h. Those still in atrial fibrillation were sedated for electrical cardioversion and observed for a further peri-	Routine hospital care: ECG and routine laboratory investigations in the ED; administration of an iv calcium channel blocker or a blocker for rate control; initia-	Conversion to sinus rhythm or rate control; recurrence of atrial fibrillation; adverse events; utilisation of healthcare resources

Table 2. Overview of included trials *(Continued)*

				ing hospitalisation	myocardial infarction; recent stroke or transient ischaemic attack; previous unsuccessful electrical cardioversion of atrial fibrillation or active medical problems other than atrial fibrillation; residence outside defined counties	od of 2 h. Those in sinus rhythm after the 2-h observation period were discharged home with cardiology follow-up arranged within 3 days. Those remaining in atrial fibrillation after unsuccessful attempts of electrical cardioversion were admitted to the hospital's cardiology service	tion of heparin infusion; admission to a monitored bed on the cardiology service	
Farkouh 1998	424	Single centre/USA	Chest pain	Age ≥ 18 years; unstable angina; intermediate risk for cardiovascular events	ST segment elevation on the ECG; obvious non-cardiac cause of chest pain	Placement in chest-pain observation unit and standardised protocol: scheduled measurement of CK-MB level; observation for minimum 6 h; 325 mg of aspirin; a cardiac function study (treadmill testing or nuclear stress studies); follow-up appointment at 72 h after discharge by staff-cardiologist	Non-standardised treatment in a monitored bed under the care of the cardiology service. This service consisted of a team of internal medicine residents or cardiology fellows under the supervision of a staff cardiologist	Composite outcome of any of the following: nonfatal myocardial infarction, death, acute congestive heart failure, stroke, or out-of-hospital cardiac arrest; additional visits to the ED for chest pain; use of any of the following procedures or tests: cardiac revascularisation, cardiac diagnostic tests, and any hospitalisation for cardiac care during the 6 months after randomisation; use of resources

Table 2. Overview of included trials *(Continued)*

Cullen 2011 Secondary publication to Farkouh 1998	424							Composite outcome of any of the following: nonfatal myocardial infarction, death, acute congestive heart failure, stroke, or out-of-hospital cardiac arrest; any cardiovascular event (long-term follow-up data)
Gomez 1996	100	Single centre/USA	Chest pain	Age > 30 years; chest pain with low risk of acute myocardial infarction (> 7% predicted probability of acute myocardial infarction due to the Goldman algorithm	ECG with acute ischaemia; sustained VT; nonsustained VT; frequent ventricular ectopic activity; SVT requiring iv medications; 2nd- or 3rd-degree heart block; new bundle branch block; need for iv nitro-glycerine; systolic BP > 220 mmHg; diastolic BP > 120 mmHg despite therapy; congestive heart failure requiring iv medications or intensive monitoring; conditions requiring iv medications or intensive nursing care	Placement in chest pain evaluation unit and standardised protocol: rapid rule-out protocol defined by iv access; administration of 325 mg oral aspirin; oxygen therapy if needed; serial CK-MB levels at 0, 3, 6, and 9 h; continuous ST- segment monitoring. If no signs of ischaemia were found, participants underwent a symptom-limited graded exercise test. If sign of ischaemia was found, participants were transferred to a coronary care unit.	Admission to hospital: participants were managed by their attending physicians who made all further triage, diagnostic, and therapeutic decisions including choice of assigned unit (coronary care unit; telemetry bed; general floor), laboratory testing, drug therapy, diagnostic testing and procedures, length of hospital stay, and timing of hospital discharge	Length of stay in hospital; costs (charges); missed diagnosis of myocardial infarction; frequency of making a final diagnosis of acute myocardial infarction or unstable angina
McDermott 1997	222	Multicentre/USA	Asthma	Age 18-55 years; his-	PaCO2 ≥ 45 mmHg, or PaO2	Placement in Emergency and Diagnostic Treatment Unit/Stan-	In-hospital treatment:	Relapse rates; discharge rate;

Table 2. Overview of included trials *(Continued)*

		tory of asthma; acute exacerbation of asthma; failure to meet discharge criteria after 3 h of ED therapy	≤ 55 mmHg, or Peak Expiratory Flow Rate ≤ 80 L/min after the first adrenergic treatment; asthma onset after age 45 years and a ≥ 10 pack-per-year history of smoking; a reported best peak flow less than a predefined discharge criterion; pregnancy; diagnosis of pneumonia, congestive heart failure, or restrictive lung disease prior to eligibility assessment	dardised protocol: scheduled administration of nebuliser at h 4, 6, 8, 10, and 12; repeated steroid dose at hour 6. If a set of predefined discharge criteria were met, participants were discharged. Discharge criteria were assessed repeatedly. If discharge criteria were not met within 12 h, participants were admitted to in-hospital service	treatment in a hospital ward according to National Asthma Guidelines: handheld nebuliser every 2 h for 3 treatments after admission and 4 times thereafter; 60 mg of methylprednisolone on arrival and every 6 h thereafter. Discharge criteria were similar to the intervention-group, but participants were only assessed at time of arrival at ward and then on daily rounds	length of stay in hospital; minor morbidity (cough, wheezing, dyspnoea, nocturnal awakenings); moderate morbidity (major lifestyle-limiting events; e.g. days missed from work or school, days incapacitated during waking hours); major morbidity (unscheduled visits for treatment of acute asthma); direct medical costs; patient satisfaction; quality of life
Rydman 1998 Secondary publication to McDermott 1997	113/222					Quality of life; clinical status as measured by peak flow rates; total costs; relapse-free survival 8 weeks after treatment
Rydman 1999 Secondary publication to McDermott 1997	163/222					Patient satisfaction; problems with care processes

Table 2. Overview of included trials *(Continued)*

Miller 2010	110	Single centre/USA	Chest pain	Age ≥ 18 years; symptoms of possible acute coronary syndrome; care provider impression that inpatient evaluation was required; ability to be discharged if cardiac disease was excluded; intermediate or high probability of having acute coronary syndrome	Initial increased troponin; new ST segment elevation (≥ 1 mV) or depression (≥ 2 mV); inability to lie flat; systolic BP < 90 mmHg; contraindications to MRI; refusal of follow-up procedures; terminal diagnosis with < 3 months to live; pregnancy; renal insufficiency; chronic liver disease; history of heart, liver, or kidney transplant	Placement in ED observation unit (trialists informed it was a multipurpose unit) and standardised protocol: cardiac biomarkers at 4 and 8 h; stress cardiac MRI examination available weekdays 8 am-5 pm. If the 4-h troponin I level was negative; participants could receive the stress cardiac MRI examination at the first available period. The short-stay unit was staffed by nurse practitioners or physician assistants and supervised by a board-certified emergency physician	Consultation in the ED by the admitting service as per customary practice (cardiology, internal medicine, or family medicine services); care delivery determined by the care providers and not dictated by a trial protocol	Costs; correct admission decision (according to acute coronary syndrome diagnosis within 30 days); number of participants randomised to short-stay unit that were able to complete cardiac MRI; utilisation of health care procedures; adverse events during MRI; adverse events leading to early termination of MRI
Miller 2011 Secondary publication to Miller 2010	110							Direct cost of cardiac-related healthcare; major cardiac events (1-year follow-up)
Miller 2013	105	Single centre/USA	Chest pain	Age ≥ 21; intermediate risk chest pain; ED attending judged the participant appropriate for intervention care; participant could be	Definite ACS at the time of enrolment; known inducible ischaemia; hypotension, contraindications to cardiac MRI; life expectancy < 3 months; pregnancy; coronary revascularisation	Placement in ED observation unit (trialists informed it was a multipurpose unit) and standardised protocol: cardiac biomarkers at 4 and 8 h; stress cardiac MRI examination available weekdays 8 am-5 pm. If the 4-h troponin I level was negative; participants could receive the stress cardiac MRI examination at the first available period. The short-stay unit was staffed by nurse practition-	Usual care: consultation in the ED by the admitting service as per customary practice (Cardiology, Internal Medicine, or Family Medicine services); care delivery deter-	Composite outcome of any of the following: coronary revascularisation, all-cause hospital readmission, recurrent cardiac testing within 90 days of randomisation; index visit

Table 2. Overview of included trials *(Continued)*

				discharge if cardiac cause of chest pain was excluded	within 6 months; increased risk for nephrogenic systemic fibrosis; clinical concern for acute kidney injury; hepatorenal syndrome; solid organ transplant	ers or physician assistants and supervised by a board-certified emergency physician. The intervention protocol differed from Miller 2010 in the cardiac MRI imaging sequences in the intervention-group	mined by the care providers and not dictated by a trial protocol	length of stay in hospital; safety events defined as an of the following: all-cause mortality within 90 days, adverse events related to index visit stress testing, or acute coronary syndrome after discharge and within 90 days of randomisation
Roberts 1997	165	Single centre/USA	Chest pain	Age > 20 years; hospitalisation necessary (physician judgement); low probability for acute myocardial infarction; ability to perform ECG exercise stress test	History of coronary artery disease; cardiac ischaemia or infarction diagnosed at presentation; protocol performance put participant at risk; concurrent or alternate non-cardiac diagnosis requiring urgent hospitalisation; problem with performance or interpretation of ECG exercise stress test	Placement in chest pain observation unit and standardised protocol: 12-h telemetry; CK-MB levels at 0, 4, 8, 12 h; ECGs at 0, 6, and 12 h; clinical examination and review of test results by an attending physician at 0, 6, and 12 h; aspirin; 2 L of oxygen by nasal cannula; iv line; nitrates if recurrent chest pain. If negative test results, participants underwent immediate ECG exercise stress test. If positive or uncertain tests results at any time, participants were admitted to the in-hospital service	Admission to telemetry unit at the internal medicine service for standard management (3 sets of cardiac enzyme studies; 2 ECGs; 24 h of cardiac and clinical monitoring); management was at the discretion of the internal medicine attending physician	Length of stay in hospital; costs; hospital admission rate
Ross 2007	149	Single centre/USA	Transient ischaemic attack	Episode of transient ischaemic attack judged by a board-certified emergency	Head CT imaging positive for bleeding, mass, or acute infarction; known possible embolic source; persis-	Placement in ED observation unit and standardised protocol: carotid imaging; echocardiography; serial clinical evaluations (serial assessments by nursing, emergency physicians, and physician assistants, and a neu-	Hospital admission: could be both stroke unit, internal medicine department, or other service.	Length of stay in hospital; 90-day total direct cost; stroke; major clinical events; recidivism; timeli-

Table 2. Overview of included trials *(Continued)*

				physician without the aid of a neurologist	tent acute neurologic deficit; crescendo transient ischaemic attacks; non-focal symptoms; hypertensive encephalopathy; severe headache or evidence of cranial arteritis; fever or other acute medical problems that required inpatient admission; previous large stroke; severe dementia; nursing home participant; participant unlikely to survive beyond trial follow-up period (90 days); social issues that made ED discharge or follow-up unlikely; history of iv drug use	rologist consultation); cardiac monitoring for at least 12 h. Participants were admitted to inward service if: recurrent neurologic symptoms or developed stroke, significant carotid stenosis requiring urgent revascularisation, evidence of a thromboembolic source, requiring inpatient anticoagulation treatment with heparin, unable to complete the evaluation or be safely discharged home in 18-24 h, or if the physician thought that admission was needed. Participants who were discharged from the ED observation unit were instructed to follow-up within 1-3 days with their primary care physician or neurologist	The ED attending physician or hospitalist service attending physician contacted the participants' primary care physicians to discuss the participants' admission. From this discussion, the emergency physician completed inpatient admission order forms, and the participants were admitted. The decision to cancel or modify the initial admitting orders and when to discharge the participant home was made by the admitting attending physician on a case-by-case basis	ness of diagnostic testing; frequency of tests completed; test outcomes
Rydman 1997	104	Single centre/USA	Chest pain	Participants in need of hospital admission but at low probability (by Goldman algorithm) for acute myocardial infarction	Known coronary artery disease; cardiac complications; severe comorbidities; inability to perform exercise testing	Placement in chest pain observation unit and standardised protocol: 12-h chest pain protocol with serial measurements of CK-MB; repetitive clinical assessments followed by ECGs	Inhospital observation with non-standardised treatment	Patient satisfaction; correlation of patient characteristics and process of care with overall patient satisfaction

Table 2. Overview of included trials *(Continued)*

Shen 2004	103	Single centre/USA	Syncope	Age ≥ 18 years; residence in defined nearby counties; syncope of undetermined cause; intermediate risk for an adverse cardiovascular outcome	Identified cause of syncope during initial evaluation in ED; any condition that would require hospital admission; non-syncope syndromes	Placement in ED syncope unit and standardised protocol: continuous cardiac monitoring for up to 6 h; hourly vital signs; orthostatic blood pressure; echocardiography if participants had abnormal cardiovascular examination findings or an abnormal ECG; tilt-table test in an electrophysiological laboratory near the syncope unit; electrophysiological consultation upon request. If tests or consultation could not be performed while the participant was in the syncope unit, arrangements for an outpatient consultation at a Heart Rhythm Centre; tilt-table testing; or echocardiography could be made within 72 h after dismissal from the unit. An educational booklet on syncope was given to each participant at the time of dismissal from the syncope unit. The unit was staffed by an ED physician and a registered nurse	Usual care: the ED physician was responsible for making the decision whether further evaluation was required and the setting in which the evaluation should occur. ED diagnostic testing was performed at the discretion of the physician on the basis of the participant's initial history. physical examination, and laboratory findings	Diagnostic yield; hospital admission rate; net diagnostic yield; length of hospital stay at the completion of the evaluation of the index event; all-cause mortality; recurrent syncope during follow-up
Strøm 2017a (Trial details obtained after contact with authors)	430	Single centre/Denmark	All internal medicine diseases or conditions	Age ≥ 75 years; acute admission to hospital for an internal medicine disease; stable (green-tag) triage at the time of admission	Previous participation in the trial, active participation in another clinical trial, lack of Danish civil registration number, residency in another country than Denmark, need of help getting to the toilet in daily life, no awareness of the current date, time and location, no awareness of name	Placement in ED short-stay unit. Discharge planning was initiated immediately after admission to the short-stay unit. If the participant needed further diagnostic tests these were performed on the same terms as in the ED, including point-of-care ultrasonography available around the clock, acute blood samples analysed in the ED's point-of-care laboratory from 8 am-10 pm, and simple X-rays in the ED's X-ray room manned from 10 am-6 pm. More advanced diagnostic examinations, such as CT or MRI scans were performed at the Department of Radiology on a fast-track	Placement in Internal Medicine Department, no standardised treatment protocols were applied	90-day mortality, mortality rate within the full observation period, in-hospital mortality, adverse events during hospitalisation, change in Lawton Instrumental Activities of Daily Living score within 90 days from admission, in-hospital length of stay in hospi-

Table 2. Overview of included trials *(Continued)*

					and date of birth, no space in the short-stay unit, or if informed consent could not be obtained	basis. Participants were encouraged to mobilise as much as possible without assistance during the stay, which usually included getting minimal help with basic self-care activities such as bathing, getting out of bed, or walking around the department		tal, unplanned hospital readmissions within 30 days after discharge, relocation to a living facility with higher level of care within 90 days from admission, and transfer to another treatment facility during hospital stay
Sun 2014	124	Multicentre/USA	Syncope	Age ≥ 50 years; intermediate risk for subsequent serious outcomes (risk stratification by semi-structured criteria based upon specialty society criteria)	Serious condition identified in ED (e.g. symptomatic arrhythmias, myocardial infarction, or pulmonary embolism); seizure, head trauma, or intoxication as the reason for loss of consciousness; new or baseline cognitive impairment; do-not-resuscitate or do-not-intubate status; active chemotherapy for cancer; inability to speak either English or Spanish	Placement in ED observation unit and standardised protocol: minimum 12 h of continuous cardiac monitoring; serial troponin test (minimum twice); resting ECG if participants had a cardiac murmur or if a rest ECG had not been performed in the previous 6 months; additional testing on discretion of the ED personnel. Participants who were diagnosed with a serious condition, had persistent symptoms of syncope, or near-syncope, were felt by the treating physician to be unable to be safely discharged home because of functional reasons, or had pending tests at 24 h were admitted to the hospital. All other participants were eligible for discharge. The treating ED team made the final decision to admit or discharge participants	Routine inpatient admission: inpatient medicine service managed participants; trial protocol did not guide the care of participants	Hospitalisation rate; hospital length-of-stay; hospital costs; quality of life; serious clinical events; patient satisfaction
Than 2014	544	Single centre/New Zealand	Chest pain	Age ≥ 18 years; symptoms consistent with acute coro-	STEMI; clear other cause than acute coronary syndrome; inability to pro-	Placement in ED observation unit and standardised protocol: calculation of the thrombolysis in myocardial infarction-score (TIMI); ECG and troponin testing.	Standard pathway; i.e. initial troponin; initial ECG, prolonged obser-	

Table 2. Overview of included trials *(Continued)*

	nary syndrome; physician planned further observation/troponin testing for possible acute myocardial infarction	vide consent; staff considered recruitment to be inappropriate; chest pain symptoms > 12 h; transfer from other hospital; pregnancy; previous inclusion in trial; inability to be discharged after hospitalisation	If TIMI = 0: placement in observation unit for 2 h; repeated ECG and troponin tests. If tests results were negative, the participant was discharged and scheduled to a 72 h outpatient treadmill test. If TIMI score was > 0 or test results were positive at any time, participants were admitted	vation, second troponin test 6-12 h after onset of pain, observation in inward unit, follow-up appointments depended on the clinician (usually 7-day follow-up with general practitioner)

BP: Blood Pressure; **bpm**: beats per minute; **CK-MB**: Creatine Kinase Myocardial B-fraction; **CT**: Computerised Tomography scan; **ECG**: electrocardiogram; **ED**: Emergency Department; **h:**hour; **iv**: intravenous; **mmHg**: Millimetres of Mercury; **mV**: Millivolt; **MRI**: magnetic resonance imaging scan: **PaCO2**: partial pressure of carbon dioxide in arterial blood; **PaO2**: partial pressure of oxygen in arterial blood; **STEMI**: ST-elevation myocardial infarction; **SVT**: supraventricular tachycardia; **VT**: ventricular tachycardia

Table 3. Contact with trialists

Study ID	Contact information	Date sent first inquiry	Date reply received	Follow-up or last reminder sent	Date reply received
Chivite 2008	dchivite@bellvitgehospital.cat	27 February 2017	6 March 2017	27 February 2017	
Decker 2008	decker.wyatt@mayo.edu	27 February 2017	27 February 2017	27 February 2017	
Farkouh 1998	cullen.michael@mayo.edu; michael.farkouh@mssm.edu	27 February 2017	No reply	11 July 2017	
Gomez 1996	ldjande3@gmail.com	27 February 2017	2 March 2017	27 February 2017	2 March 2017
McDermott 1997	robert.j.rydman@uic.edu; rroberts@rush.edu	28 February 2017	No reply	11 July 2017	No reply
Miller 2010	cmiller@wakehealth.edu	28 February 2017	28 February 2017	NA	No reply
Miller 2013	cmiller@wakehealth.edu	28 February 2017	28 February 2017	NA	No reply
Roberts 1997	robert.j.rydman@uic.edu; rroberts@rush.edu	28 February 2017	No reply	11 July 2017	No reply
Ross 2007	mross@beaumont.edu	28 February 2017	No reply	11 July 2017	No reply
Rydman 1997	robert.j.rydman@uic.edu; rroberts@rush.edu	28 February 2017	No reply	11 July 2017	NA
Shen 2004	wshen@mayo.edu	28 February 2017	28 February 2017	NA	13 July 2017
Strøm 2017a	cstr@regionsjaelland.dk	3 March 2017	3 March 2017	NA	NA
Sun 2014	sunb@ohsu.edu	28 February 2017	28 February 2017	NA	
Than 2014	martin@thanstedman.onmicrosoft.com	28 February 2017	28 February 2017	11 July 2017	

Table 4. Mortality at the time point closest to 90 days

This table was missing, and had to be replaced.

Table 5. Mortality at maximum follow-up

Study ID	Dead in short-stay unit (n)	Analysed short-stay unit (n)	Randomised short-stay unit (n)	Dead in usual-care group (n)	Analysed usual-care group (n)	Randomised usual-care group (n)	'Risk of bias' judgement	Time point
Chivite 2008	5	65	70	3	62	69	High	90 days
Decker 2008	0	75	75	0	78	78	High	6 months
Farkouh 1998	17	204	212	17	203	212	High	Maximum observation time median 5.5 years (IQR 4.8-6.0 years)
Gomez 1996	0	50	50	0	50	50	High	30 days
McDermott 1997	0	110	110	1	112	112	High	8 weeks
Miller 2010	0	52	53	0	57	57	High	1 year
Miller 2013	0	52	52	0	53	53	High	90 days
Roberts 1997	0	82	82	0	83	83	High	8 weeks
Shen 2004	2	51	51	3	52	52	High	2 years
Strøm 2017a	42	208	215	55	210	215	High	Maximum observation time ranged between 90 and 641 days per participant
Sun 2014	0	62	62	0	62	62	High	Within admission
Than 2014	0	270	271	0	272	273	High	30 days

IQR: interquartile range; **n**: number of participants

Table 6. Serious adverse events (SAEs) at the time point closest to 90 days

Study ID	Definition	Participants with SAE in short-	Participants analysed short-stay unit (n)	Participants randomised short-stay unit (n)	Participants with SAE in usu-	Participants randomised analysed usu-	Participants randomised usu-	'Risk of bias' judgement	Time point

Table 6. Serious adverse events (SAEs) at the time point closest to 90 days *(Continued)*

		stay unit (n)			al-care group (n)	al-care group (n)	al-care group (n)		
Decker 2008	Myocardial infarction, congestive heart failure, stroke, death	0	75	75	1	78	78	Unclear, may or may not have been at risk of subjective interpretation	6 months
Farkouh 1998	Composite endpoint of death (any cause), myocardial infarction, stroke, heart failure, and out-of-hospital cardiac arrest	8	212	212	17	212	212	High because we judged external validity of judgment of adverse events to be low	30 days
Miller 2010	Acute coronary syndrome within 30 days after discharge	0	51	53	0	57	57	Unclear, may or may not have been at risk of subjective interpretation	30 days
Miller 2013	Safety events (death, acute coronary syndrome after discharge, stress testing adverse events)	0	52	52	3	53	53	High because we judged external validity of judgment of adverse events to be low	90 days
Ross 2007	Stroke within 90 days, major clinical events (seizures, foramen ovale closure etc.) and major adverse cardiac events (major dysrhythmia, new myocardial infarction, cardiac arrest, revascularisation, new congestive heart failure, cardiac death)	7	75	75	6	74	74	High because we judged external validity of judgment of adverse events to be low	90 days
Strøm 2017a	Mortality in hospital	7	208	215	9	210	215	Unclear, may or may not have been at risk of subjective interpretation	Index admission
Sun 2014	Serious clinical events that occurred after discharge from index visit, including death, ventricular arrhythmia, heart block, sick sinus syndrome, sinus pause > 3 seconds, symptomatic supraventricular tachycardia, symptomatic bradycardia,	7	59	62	3	57	62	High because we judged external validity of judgment of adverse events to be low	30 days

Table 6. Serious adverse events (SAEs) at the time point closest to 90 days *(Continued)*

	major cardiac intervention, myocardial infarction, stroke, pulmonary embolism, aortic dissection, non-traumatic intracranial haemorrhage, internal haemorrhage or anaemia requiring transfusion, and major traumatic injury associated with syncope, near-syncope or fall								
Than 2014	Major adverse cardiac event: cardiac death, cardiac arrest, emergency revascularisation procedure, cardiogenic shock, ventricular arrhythmia needing intervention, high-degree atrioventricular block needing intervention, or myocardial infarction	47	270	271	35	272	273	High because we judged external validity of judgment of adverse events to be low	30 days

n: number of participants; **SAE**: serious adverse event

Table 7. Serious adverse events (SAEs) at maximum follow-up

Study ID	Definition	Participants with SAE in short-stay unit (n)	Participants analysed short-stay unit (n)	Participants randomised short-stay unit (n)	Participants with SAE in usual-care group(n)	Participants randomised analysed usual-care group(n)	Participants randomised usual-care group(n)	Risk of bias outcome	Time-point
Decker 2008	Myocardial infarction, congestive heart failure, stroke, death	0	75	75	1	78	78	Unclear, may or may not have been at risk of subjective interpretation	6 months
Farkouh 1998	Composite endpoint of death (any cause), myocardial infarction, stroke, heart failure, and out-of-hospital cardiac arrest	44	204	212	41	203	212	High because we judged external validity of judgment of adverse events to be low	Maximum observation time median 5,5 years (IQR 4.8-6 years)

Table 7. Serious adverse events (SAEs) at maximum follow-up *(Continued)*

Miller 2010	Acute coronary syndrome within 30 days after discharge	3	52	53	5	57	57	Unclear, may or may not have been at risk of subjective interpretation	30 days
Miller 2013	Safety events (death, acute coronary syndrome after discharge, stress testing adverse events)	0	52	52	3	53	53	High because we judged external validity of judgment of adverse events to be low	90 days
Ross 2007	Stroke within 90 days, major clinical events (seizures, foramen ovale closure etc.) and major adverse cardiac events (major dysrhythmia, new myocardial infarction, cardiac arrest, revascularisation, new congestive heart failure, cardiac death)	7	75	75	6	74	74	High because we judged external validity of judgment of adverse events to be low	90 days
Strøm 2017a	Mortality in-hospital	7	208	215	9	210	215	Unclear, may or may not have been at risk of subjective interpretation	Index admission
Sun 2014	Serious clinical events that occurred after discharge from index visit, including death, ventricular arrhythmia, heart block, sick sinus syndrome, sinus pause > 3 seconds, symptomatic supraventricular tachycardia, symptomatic bradycardia, major cardiac intervention, myocardial infarction, stroke, pulmonary embolism, aortic dissection, non-traumatic intracranial haemorrhage, internal haemorrhage or anaemia requiring transfusion, and major traumatic injury associated with syncope, near-syncope or fall	9	53	62	8	52	62	High because we judged external validity of judgment of adverse events to be low	6 months
Than 2014	Major adverse cardiac event: cardiac death, cardiac arrest, emergency revascularisation procedure, cardiogenic shock, ventricular arrhythmia	47	270	271	35	272	273	High because we judged external validity of judgment	30 days

Table 7. Serious adverse events (SAEs) at maximum follow-up *(Continued)*

	needing intervention, high-degree atrioventricular block needing intervention, or myocardial infarction		of adverse events to be low

IQR: interquartile range; **n**: number of participants; **SAE**: serious adverse event

Table 8. Quality of life

Study ID	Scale	Elaboration of scale used	Reason for admission	Time-point of assessment, type of score	
				Participants evaluated (n)/randomised per group (n)	Outcomes as reported in trial paper
Chivite 2008	Minnesota Living With Heart Failure Quality of Life Scale	Patient self-assessment of how heart failure affects participants' daily life, 21 items. Each item assessed on a 5-point Likert scale from 1 ('completely agree') to 5 ('completely disagree'). Total score ranges from 5–105 (from best to worst)	Acute illness	**Mean end-score (SD) at 3 months**	
				Short-stay unit: 59/70	Short-stay unit: 23 (9)
				Usual care: 59/69	Usual care: 22 (9)
				Difference	Mean difference: not provided
				Mean end-score (SD) at 12 months	
				Short-stay unit: 48/70	Short-stay unit: 22 (12)
				Usual care: 47/69	Usual care: 22 (12)
				Difference	Mean difference: not provided
Chivite 2008	European Heart Failure Self-Care Behaviour Scale	9 items grouped in 2 dimensions: consulting behaviours and adherence with treatment regimen. Each item assessed on a 5-point Likert scale from 1 ('completely agree') to 5 ('completely disagree'). Total score ranges from 9-45	Acute illness	Numbers not provided	Numbers not provided
McDermott 1997	The Short Form-36 Health Survey	8-scale score system. Each scale is directly transformed into a 0-100 scale on the assumption that each question carries equal weight. The lower the score the more disability	Asthma	**Mean end-score (SD) at 1 week**	
				Short-stay unit: 57/110	Short-stay unit: physical functioning 72 (27.43); physical functioning role 48 (43.00); emotional functioning role 78 (51.31); social functioning 80 (27.95); bodily pain 78 (28.10); mental health 78 (19.44); vitality 59 (22.99); general health perceptions 48 (23.05)
				Usual care: 56/112	Usual care: physical functioning 58 (29.04); physical functioning role 35 (43.09); emotional functioning role 45 (44.62); social functioning 68 (29.27); bodily pain 74 (29.52); mental health 67

Table 8. Quality of life *(Continued)*

					(26.00); vitality 47 (25.73); general health perceptions 47 (19.60)
Sun 2014	The Syncope Functional Status Questionnaire for symptom-specific quality of life	Ranges from 0-100; 0 indicates no syncope-related impairment and 100 indicates maximum impairment	Syncope	**Mean change score (SD) at 1 month**	
				Short-stay unit: 48/62	Short-stay unit: -7.6 (20.1)
				Usual care: 41/62	Usual care: -2.4 (26.3)
				Difference	Mean difference: -5.2 (95% CI -15.2;4.8)
Sun 2014	Change in Quality of Well Being Scale for general health utility	Ranges from 0-1; 0 indicates the worst possible health and 1 indicates optimum health	Syncope	**Mean change score (SD) at 1 month**	
				Short-stay unit: 48/62	Short-stay unit: 0.00 (0.20)
				Usual care: 41/62	Usual care: 0.03 (0.18)
				Difference	Mean difference: -0.02 (95% CI -0.10;0.06)
Than 2014	EuroQol-5 Domain	Descriptive system of health-related quality-of-life states, consisting of 5 dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression)	Chest pain	**Mean health utility end-score (SD) at 3 months**	
				Short-stay unit: 253/470	Short-stay unit: 0.716 (SD 0.109)
				Usual care: 250/272	Usual care: 0.728 (SD 0.093)
				Notes	We obtained data through contact with trialists. We imputed missing data; for each participant without missing data for any one of the EQ-5D dimensions, we calculated a tariff value based on the 1999 New Zealand tariff data of a healthy population

CI: confidence interval; **EQ-5D**: EuroQol-5 Domain; **n**: number of participants; **SD**: standard deviation

Table 9. Hospital readmission at the time point closest to 90 days

Study ID	Definition	Participants with readmission in short-stay unit (n)	Participants analysed short-stay unit (n)	Participants randomised short-stay unit (n)	Participants with readmission in usual-care group(n)	Participants randomised analysed usual-care group(n)	Participants randomised usual-care group(n)	'Risk of bias' judgement	Time point
Chivite 2008	Hospital readmission with a main diagnosis of acute heart failure	19	65	70	14	62	69	Unclear, may or may not have been at risk of subjective interpretation	90 days
Decker 2008	Hospital readmission, any type	25	75	75	27	78	78	Low, objective measurement	6 months
Farkouh 1998	Hospital readmission to cardiac care	?	?	212	?	?	212	Unclear, may or may not have been at risk of subjective interpretation	6 months
Miller 2010	Cardiac-related hospital readmission	0	53	53	3	57	57	Unclear, may or may not have been at risk of subjective interpretation	30 days
Miller 2013	Hospital readmission, any type	4	52	52	12	53	53	Low, objective measurement	90 days
Roberts 1997	Hospital readmission, any type	5	82	82	4	83	83	Low, objective measurement	8 weeks
Ross 2007	Hospital readmission or revisit, not entirely clear	9	75	75	9	74	74	Unclear, may or may not have been at risk of subjective interpretation	90 days
Strøm 2017a	Hospital readmission, any type	26	201	215	58	201	215	Low, objective measurement	30 days
Than 2014	Hospital readmission, any type	22	270	271	20	272	273	Low, objective measurement	30 days

n: number of participants, **?**: numbers not given in trial paper

Table 10. Hospital readmission at maximum follow-up

Study ID	Definition	Participants with readmission in short-stay unit (n)	Participants analysed short-stay unit (n)	Participants randomised short-stay unit (n)	Participants with readmission in usual-care group(n)	Participants randomised analysed usual-care group(n)	Participants randomised usual-care group(n)	Risk of bias outcome	Time point
Chivite 2008	Hospital readmission with a main diagnosis of acute heart failure	25	53	70	21	53	69	Low, objective measurement	12 months
Decker 2008	Hospital readmission, any type	25	75	75	27	78	78	Unclear, may or may not have been at risk of subjective interpretation	6 months
Farkouh 1998	Hospital readmission to cardiac care	?	?	212	?	?	212	Unclear, may or may not have been at risk of subjective interpretation	Unclear
Miller 2010	Cardiac-related hospital readmission	6	52	53	20	57	57	Unclear, may or may not have been at risk of subjective interpretation	1 year
Miller 2013	Hospital readmission, any type	4	52	52	12	53	53	Low, objective measurement	90 days
Roberts 1997	Hospital readmission, any type	5	82	82	4	83	83	Low, objective measurement	8 weeks
Ross 2007	Hospital readmission or revisit, not entirely clear	9	75	75	9	74	74	Unclear, may or may not have been at risk of subjective interpretation	90 days
Strøm 2017a	Hospital readmission, any type	26	201	215	58	201	215	Low, objective measurement	30 days
Than 2014	Hospital readmission, any type	22	270	271	20	272	273	Low, objective measurement	30 days

n: number of participants; **?**: numbers not given in trial paper

Table 11. Length of stay in hospital

Study	Reason for admission	Participants evaluated/randomised in short-stay group (n/n)	Length of stay in hours, mean (SD)	Length of stay in hours, median (IQR)	Participants evaluated/randomised in usual-care group (n/n)	Length of stay in hours, mean (SD)	Length of stay in hours, median (IQR)	Risk of bias for outcome	Notes
Chivite 2008	Heart failure	70/70	96.0 (120)		69/69	216.0 (96.0)		Low due to objective measurement	
Decker 2008	Atrial fibrillation	75/75	12.6 (unclear)	10.1 (unclear)	78/78	50.1 (unclear)	25.2 (unclear)	Low due to objective measurement	
Farkouh 1998	Chest pain	unclear/212	9.2 (unclear)		unclear/212	unclear		Low due to objective measurement	
Gomez 1996	Chest pain	50/50	15.4 (12.2)	12.1 (8.9-16.0)	50/50	54.6 (126)	22.3 (17.1-40.2)	Low due to objective measurement	
McDermott 1997	Asthma	Short-stay unit reported by 2 subgroups 1) Discharged home 65/110 2) Admitted to hospital 45/110	1) Discharged home 8.8 (3.6) 2) Admitted to hospital 77.0 (43.5)	NA	112/112	59.0 (35.9)	NA	Low due to objective measurement	Length of stay in hospital was measured at different time points for intervention group, either discharge from short-stay unit facility or from time of discharge from hospital
Miller 2010	Chest pain	53/53	31.4 (31.3)	25.7 (20.7-31.3)	57/57	36.6 (22.9)	29.9 (26.7-35.7)	Low due to objective measurement	
Miller 2013	Chest pain	52/52	26.6 (16.9)	21.1 (14.8-25.2)	53/53	51 (65.6)	26.3 (22.7-44.8)	Low due to objective measurement	
Roberts 1997	Chest pain	82/82	33.1 (28.1)		83/83	44.8 (31.8)		Low due to objective measurement	

Table 11. Length of stay in hospital *(Continued)*

Ross 2007	Transient ischaemic attack	75/75		25.6 (21.9-28.7)	74/74		61.2 (41.6-92.2)	Low due to objective measurement	
Shen 2004	Syncope	22/51	69.6 (55.2)	48.0 (unclear)	51/52	64.8 (90.0)	48.0 (unclear)	Low due to objective measurement	Length of stay in hospital only provided for participants that were admitted to in-hospital services. Results were re-calculated from days to hours
Strøm 2017a	Internal medicine diseases or conditions	208/215		73 (36-147)	210/215		100 (47-169)	Low due to objective measurement	
Sun 2014	Syncope	62/62	29.0 (15.0)		60/62	47.0 (34.0)		Low due to objective measurement	

CI: confidence interval; **IQR**: interquartile range; **n**: number of participants; **SD**: standard deviation

Table 12. Costs

Study	Reason for admission	Definition	Time point	Participants evaluated/randomised in short-stay group (n/n)	Ccosts, mean (SD)	Costs, median (IQR)	Participants evaluated/randomised in usual-care group (n/n)	Costs, mean (SD)	Costs, median (IQR)
Chivite 2008	Heart failure	In-hospital costs	Index admission	unclear/70	EUR 779.43 (573.09)		unclear/69	EUR 2311.12 (1847.46)	

Table 12. Costs *(Continued)*

		Total costs (in-hospital costs and follow-up)	Not clearly defined		EUR 2488.60 (956.62)			EUR 3574.14 (1018,95)	
Farkouh 1998	Chest pain	Costs related to cardiovascular care	6 months	unclear/212	not reported	not reported	unclear/212	not reported	not reported
Gomez 1996	Chest pain	Total hospital charges	30 days	50/50		USD 904 (USD 731-USD 1347)	50/50		USD 1542 (USD 1142-USD 3845)
McDermott 1997[a]	Asthma	Costs during hospitalisation	Index admission	unclear/110	USD 1202 (USD 1343)		unclear/112	USD 2247 (USD 1110)	
Miller 2010	Chest pain	Patient charges	Index admission	53/53		USD 2062 (USD 1918-USD 2367)	57/57		USD 2680 (USD 2408-USD 3448)
		Cardiac costs	1 year	53/53		USD 2186 (USD 1957-USD 4308)	57/57		USD 3850 (USD 2669-USD 9710)
Roberts 1997	Chest pain	In-hospital costs	Index admission	82/82	USD 1528 (USD 1012)		83/83	USD 2095 (USD 2095)	
Ross 2007	Transient ischaemic attack	In-hospital costs	Index admission	75/75		USD 864 (USD 726-USD 1076)	74/74		USD 1529 (USD 1091-USD 2306)
		Median 90-day total costs	90 days	75/75		USD 890 (USD 768-USD 1510)	74/74		USD 1548 (USD 1091-USD 2474)
Sun 2014	Syncope	In-hospital costs	Index admission	62/62		USD 1190 (USD 870-USD 1550)	62/62		USD 1570 (USD 870;USD 2370)
		In-hospital costs and follow-up	30 days	62/62		USD 1210 (USD 948-USD 1660)	62/62		USD 1210 (USD 948-USD 1660)

CI: confidence interval; **EUR**: Euro; **IQR**: interquartile range; **n**: number of participants; **SD**: standard deviation; **USD**: American dollars

[a]First 130 of 222 recruited participants were evaluated

APPENDICES

Appendix 1. Names and synonyms for short-stay units

1. Accident and Emergency Department Short-stay Unit
2. Acute Admission and Diagnostic Unit
3. Acute Admissions Unit
4. Acute Assessment Unit
5. Acute Care for Elders Unit
6. Acute Diagnostic Unit
7. Acute Elderly Unit
8. Acute Geriatric Unit
9. Acute Geriatrics-based Wards
10. Acute Medical Receiving Unit
11. Acute Medical Unit
12. Acute Medicine Unit
13. Chest Pain Center
14. Chest Pain Observation Unit
15. Clinical Decision Unit
16. Elderly Short-stay Unit
17. Emergency Assessment Unit
18. Emergency Department Asthma and Observation Unit
19. Emergency Department Observation Unit
20. Emergency Diagnostic and Treatment Unit
21. Emergency Medical Assessment/Admissions Unit
22. Emergency Short-stay Unit
23. Extended Evaluation Unit
24. Fast Specialized Ambulatory Care of Medical Disease
25. Fast Track Medical Ward
26. Geriatric Assessment Unit
27. Geriatric Evaluation and Management Unit
28. Immediate Care Clinics
29. Medical Acute Care Unit
30. Medical Assessment and Planning Unit
31. Medical Assessment Unit
32. Medical Short-stay Unit
33. Observation Unit
34. Orthogeriatric Unit for Acute Patients
35. Quick and Early Diagnosis Unit
36. Quick and Early Diagnostic Outpatient Unit
37. Quick diagnostic unit
38. Rapid diagnosis unit
39. Short-stay Clinic
40. Short-stay Hospital Unit
41. Short-stay Medical Unit
42. Short-stay Older Persons Unit
43. Short-stay Unit
44. Short-stay Unit for Older Persons
45. Short-stay Observation Unit
46. Short-stay Respiratory Unit
47. Week Hospital

Appendix 2. Search strategies

MEDLINE (Ovid)

Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE and Versions(R)

No.	Search terms	Results
1	((emergency or geriatric? or medical) adj3 (planning or evaluation or assessment or asthma or observation or diagnos* or admission? or treatment) adj3 (unit? or ward?)).ti,ab.	1811
2	((quick or early or rapid) adj3 diagnos* adj3 (unit? or ward?)).ti,ab.	96
3	week hospital?.ti,ab.	112
4	short stay*.ti.	583
5	(acute adj3 hospital adj3 (unit? or ward?)).ti,ab.	544
6	(chest pain adj3 (center? or centre? or unit? or ward?)).ti,ab.	674
7	(clinical decision adj (unit? or ward?)).ti,ab.	41
8	(extended evaluation adj (unit? or ward?)).ti,ab.	1
9	((short stay* or fast-track or fasttrack or brief stay or short term or fast speciali*) adj3 (clinic? or unit? or ward? or care or department? or hospital* or service? or facilit* or center? or centre?)).ti,ab.	4668
10	(immediate care adj (clinic? or unit? or ward? or centre? or center?)).ti,ab.	7
11	(observation adj (unit? or ward?)).ti,ab.	874
12	(acute adj3 (admission? or diagnos* or assessment or care or elderly or geriatric? or orthogeriatric? or medical or medicine) adj3 (unit? or ward?)).ti,ab.	3666
13	(orthogeriatric adj (unit? or ward?)).ti,ab.	64
14	or/1-13	11811
15	exp randomized controlled trial/	515248
16	controlled clinical trial.pt.	101721
17	randomi#ed.ti,ab.	582212
18	placebo.ab.	210465
19	randomly.ti,ab.	312358
20	Clinical Trials as topic.sh.	202436
21	trial.ti.	203181
22	or/15-21	1300464

(Continued)

23	exp animals/ not humans/	4810234
24	22 not 23	1201092
25	14 and 24	1126

Embase (Ovid)

Embase <1974 to 2017 December 12>

No.	Search terms	Results
1	((emergency or geriatric? or medical) adj3 (planning or evaluation or assessment or asthma or observation or diagnos* or admission? or treatment) adj3 (unit? or ward?)).ti,ab.	2644
2	((quick or early or rapid) adj3 diagnos* adj3 (unit? or ward?)).ti,ab.	134
3	week hospital?.ti,ab.	176
4	short stay*.ti.	711
5	(acute adj3 hospital adj3 (unit? or ward?)).ti,ab.	720
6	(chest pain adj3 (center? or centre? or unit? or ward?)).ti,ab.	988
7	(clinical decision adj (unit? or ward?)).ti,ab.	82
8	(extended evaluation adj (unit? or ward?)).ti,ab.	1
9	((short stay* or fast-track or fasttrack or brief stay or short term or fast speciali*) adj3 (clinic? or unit? or ward? or care or department? or hospital* or service? or facilit* or center? or centre?)).ti,ab.	6091
10	(immediate care adj (clinic? or unit? or ward? or centre? or center?)).ti,ab.	10
11	(observation adj (unit? or ward?)).ti,ab.	1254
12	(acute adj3 (admission? or diagnos* or assessment or care or elderly or geriatric? or orthogeriatric? or medical or medicine) adj3 (unit? or ward?)).ti,ab.	5140
13	(orthogeriatric adj (unit? or ward?)).ti,ab.	140
14	or/1-13	16231
15	random*.ti,ab.	1271058
16	factorial*.ti,ab.	31916
17	(crossover* or cross over*).ti,ab.	92321
18	((doubl* or singl*) adj blind*).ti,ab.	204646

(Continued)

19	(assign* or allocat* or volunteer* or placebo*).ti,ab.	886972
20	crossover procedure/	54460
21	single blind procedure/	30503
22	randomized controlled trial/	486392
23	double blind procedure/	146288
24	or/15-23	1966881
25	exp animal/ not human/	4934761
26	24 not 25	1762445
27	14 and 26	1915

The Cochrane Library (Wiley)

No.	Search terms	Results
#1	((emergency or geriatric* or medical) near/3 (planning or evaluation or assessment or asthma or observation or diagnos* or admission* or treatment) near/3 (unit* or ward*)):ti,ab	149
#2	((quick or early or rapid) near/3 diagnos* near/3 (unit* or ward*)):ti,ab	7
#3	week next hospital*:ti,ab	38
#4	short next stay*:ti	56
#5	(acute near/3 hospital near/3 (unit* or ward*)):ti,ab	74
#6	(chest pain near/3 (center* or centre* or unit* or ward*)):ti,ab	55
#7	(clinical decision near/1 (unit* or ward*)):ti,ab	2
#8	(extended evaluation near/1 (unit* or ward*)):ti,ab	1
#9	((short stay* or fast-track or fasttrack or brief stay or short term or fast speciali*) near/3 (clinic* or unit* or ward* or care or department* or hospital* or service* or facilit* or center* or centre*)):ti,ab	1248
#10	(immediate care near/1 (clinic* or unit* or ward* or centre* or center*)):ti,ab	416
#11	(observation near/1 (unit* or ward*)):ti,ab	97
#12	(acute near/3 (admission* or diagnos* or assessment or care or elderly or geriatric* or orthogeriatric* or medical or medicine) near/3 (unit* or ward*)):ti,ab	363
#13	(orthogeriatric near/1 (unit* or ward*)):ti,ab	8

(Continued)

#14	{or #1-#13}	2347

ClinicalTrials.gov

	Search terms
[Titles]	acute admission OR acute assessment OR acute care OR acute diagnostic OR acute elderly OR acute geriatric OR acute medical OR acute medicine OR chest pain center OR clinical decision OR emergency assessment
[Titles]	emergency diagnostic and treatment OR emergency medical assessment OR emergency medical admission OR extended evaluation OR fast specialized OR fast track OR immediate care OR medical assessment
[Titles]	observation unit OR quick and early OR quick diagnostic OR rapid diagnosis OR short-stay OR week hospital OR AMU OR SSU

WHO International Clinical Trials Registry Platform (ICTRP)

“acute admission and diagnostic unit” OR “acute admissions unit” OR “acute assessment unit” OR “acute care for elders unit” OR “acute diagnostic unit” OR “acute elderly unit” OR “acute geriatric unit” OR “acute geriatrics-based wards” OR “acute medical receiving unit” OR “acute medical unit” OR “acute medicine unit” OR “chest pain center” OR “clinical decision unit” OR “emergency assessment unit” OR “emergency diagnostic and treatment unit” OR “emergency medical assessment unit” OR “emergency medical admissions unit” OR “extended evaluation unit” OR “fast specialized ambulatory care of medical disease” OR “fast track medical ward” OR “geriatric assessment unit” OR “geriatric evaluation and management unit” OR “immediate care clinics” OR “medical acute care unit” OR “medical assessment and planning unit” OR “medical assessment unit” OR “observation unit” OR “orthogeriatric unit” OR “quick and early diagnosis unit” OR “quick and early diagnostic outpatient unit” OR “quick diagnostic unit” OR “rapid diagnosis unit” OR “short-stay” OR “week hospital”

Appendix 3. Screening algorithm for titles and abstracts

1. Does the trial compare treatment in a short-stay unit with usual care?
2. Does the trial include adult participants (≥ 18years)
3. Does the trial include patients admitted to treatment for an internal medical disease or condition (participants)?
4. Does the trial meet design criteria; either 1) randomised trial, 2) randomised step wedge design trial, 3) cluster randomised trial?

If the answer to all the questions is “yes” or ”not clear”, the entire text of the paper will be examined.

Appendix 4. Full GRADE evidence profile

Author(s): Strøm et al

Date: 2 December 2017

Question: Short-stay unit hospitalisation compared to usual care for internal medicine diseases and conditions

Bibliography: Strøm C, Stefanson JS, Fabritius ML, Rasmussen LS, Schmidt TA, Jakobsen JC. Hospitalisation in short-stay units for internal medicine diseases and conditions. Cochrane Database of Systematic Reviews [Year], Issue [Issue].

Certainty assessment						
№ of participants (studies) Follow-up	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Overall certainty of evidence**
Mortality at time point closest to 90 days						
1294 (5 RCTs)	Serious[a]	Serious[b]	Not serious[c]	Very serious[d]	None	⊕◯◯◯ Very low
Serious adverse events at time point closest to 90 days						
1907 (7 RCTs)	Serious[a]	Serious[b]	Serious[e]	Very serious[d]	None	⊕◯◯◯ Very low
Hospital readmission at the time point closest to 90 days						
1753 (8 RCTs)	Serious[a]	Very serious[f]	Not serious[c]	Very serious[d]	None	⊕◯◯◯ Very low
Quality of life at time point closest to 90 days						
1029 (4 RCTs)	Very serious[g]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊖⊖⊖ Very low
Activities of daily living at time point closest to 90 days						
569 (2 RCTs)	Very serious[g]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊖⊖⊖ Very low
Non-serious adverse events at time point closest to 90 days						

(Continued)

533 (2 RCTs)	Very serious[g]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊖⊖⊖ Very low
1847 (8 RCTs)	Very serious[g]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊖⊖⊖ Very low
Total length of stay in hospital at time point closest to 90 days						
2224 (12 RCTs)	Serious[a]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊕⊖⊖ Low
Costs at time point closest to 90 days						
1433 (8 RCTs)	Very serious[g]	Serious[b]	Not serious[c]	Not serious[h]	None	⊕⊖⊖⊖ Very low

CI: Confidence interval; **RR:** Risk ratio

[a]Downgraded one level for serious risk of bias due to all trials being at high risk of bias, but because the outcome is a more objective outcome, lack of blinding of participants, personnel and outcome assessors may not bias the outcome as much.
[b]Downgraded one level for clinical heterogeneity among the included trials.
[c]Not downgraded for indirectness.
[d]Downgraded two levels due to low number of events and the 95% CI around the pooled estimate of effect included both appreciable benefit or appreciable harm.
[e]Downgraded one level due to indirect evidence (surrogate outcome measures for adverse events).
[f]Downgraded two levels for clinical and statistical heterogeneity among the included trials
[g]Downgraded two levels for very serious risk of bias due to all trials being at high risk of bias.
[h]Not downgraded for imprecision. We were not able to evaluate estimate of effect in meaningful meta-analysis.

CONTRIBUTIONS OF AUTHORS

Designing the protocol: CS, MF, LS, TAS, JCJ

Conceiving the review: CS, JS, MF, LS, TAS, JCJ

Retrieval of studies: CS, PM

Selection of studies for inclusion/exclusion and data collection: CS, JS, MF, JCJ

Analyses, writing of review: CS

Critical feedback on analyses and drafts of review: JS, MF, LS, TAS, JCJ

DECLARATIONS OF INTEREST

Three review authors of this review (CS, LS, TS) conducted one of the included trials (Strøm 2017a). In this review, two review authors who had not been involved in the trial (MF and JS) assessed it.

Camilla Strøm has no other conflicts of interest.

Jakob Skulason Stefanson has no conflicts of interest.

Maria Louise Fabritius has no conflicts of interest.

Lars S Rasmussen has no other conflicts of interest.

Thomas A Schmidt has no other conflicts of interest.

Janus C Jakobsen has no conflicts of interest.

SOURCES OF SUPPORT

Internal sources

- Faculty of Health and Medical Sciences, University of Copenhagen, Denmark.

  CS has received a PhD stipend, this review is part of the PhD project.
- Region Zealand, Denmark.

  CS has received a PhD stipend, this review is part of the PhD project.

External sources

- Tryg Foundation, Denmark.

  LS has received funding from Tryg Foundation for other projects.
- Region Zealand Research Foundation, Denmark.

  CS has received a EUR 10,000 grant for a PhD project, this review will be part of the project.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Jakob Skulason Stefanson was added as a review author (second author); he was involved in the study selection process, data collection process of all included trials, and provided feedback on the manuscript drafts.

We were not able to conduct the following subgroup analyses on the outcomes mortality, serious adverse events, and hospital readmission:

- comparison of the effect of short-stay unit hospitalisation compared with usual care between trials with low and lower risks of bias compared with trials with trials with high risk of bias, because all trials were judged to be of high risk of bias;
- comparison of the effect of short-stay unit hospitalisation compared with usual care between trials investigating emergency department-based short-stay units compared with non-emergency department based short-stay units, because all trials investigated emergency department-based short-stay units;
- comparison of the effect of short-stay unit hospitalisation compared with usual care between trials investigating protocol-specific interventions in short-stay unit compared with non-protocol-specific interventions in short-stay unit;
- comparison of the effect of short-stay unit hospitalisation compared with usual care between trials investigating units with a targeted length of stay in hospital of five or fewer days compared with no defined or longer length of stay in hospital for participants, because all trials investigated short-stay units with a targeted length of stay in hospital shorter than five days.

We were not able to conduct the following sensitivity analyses:

- restricting the analyses to trials with a low risk of bias, as specified in Assessment of risk of bias in included studies;
- restricting the analyses to trials that evaluated outcomes at least once within six months of inclusion.

We were not able to conduct any sensitivity analyses for continuous outcomes.

We were not able to conduct meta-analyses for the outcomes quality of life, activities of daily living, non-serious adverse events, transfer to other department, and length of stay in hospital, because data were too sparse or reported in an unusable way.

It was impossible to evaluate treatment effects according to the predefined values for clinical significance for each outcome, because data were either lacking or sparse with very wide confidence intervals that showed serious imprecision (imprecise confidence estimates).

We did not use the eight-step procedure to assess whether or not the thresholds for statistical and clinical significance were crossed, as stated in the protocol. This change was made to comply with EPOC guidance at the request of the EPOC editors.

INDEX TERMS

Medical Subject Headings (MeSH)

*Internal Medicine; *Length of Stay; Activities of Daily Living; Asthma; Atrial Fibrillation; Chest Pain; Heart Failure; Hospital Mortality; Hospital Units [*classification]; Ischemic Attack, Transient; Patient Readmission; Quality of Life; Randomized Controlled Trials as Topic; Syncope; Time Factors

MeSH check words

Adult; Humans